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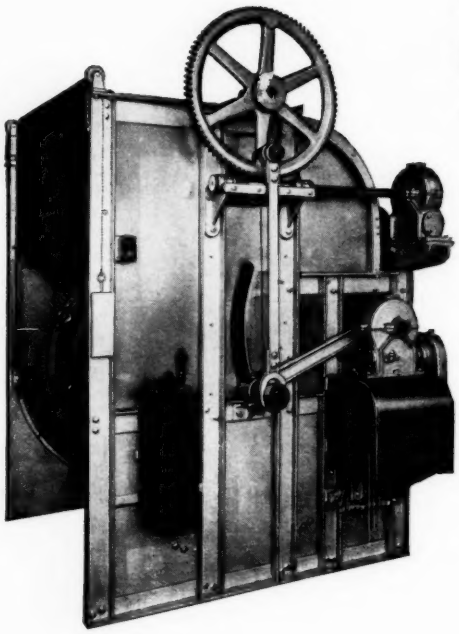

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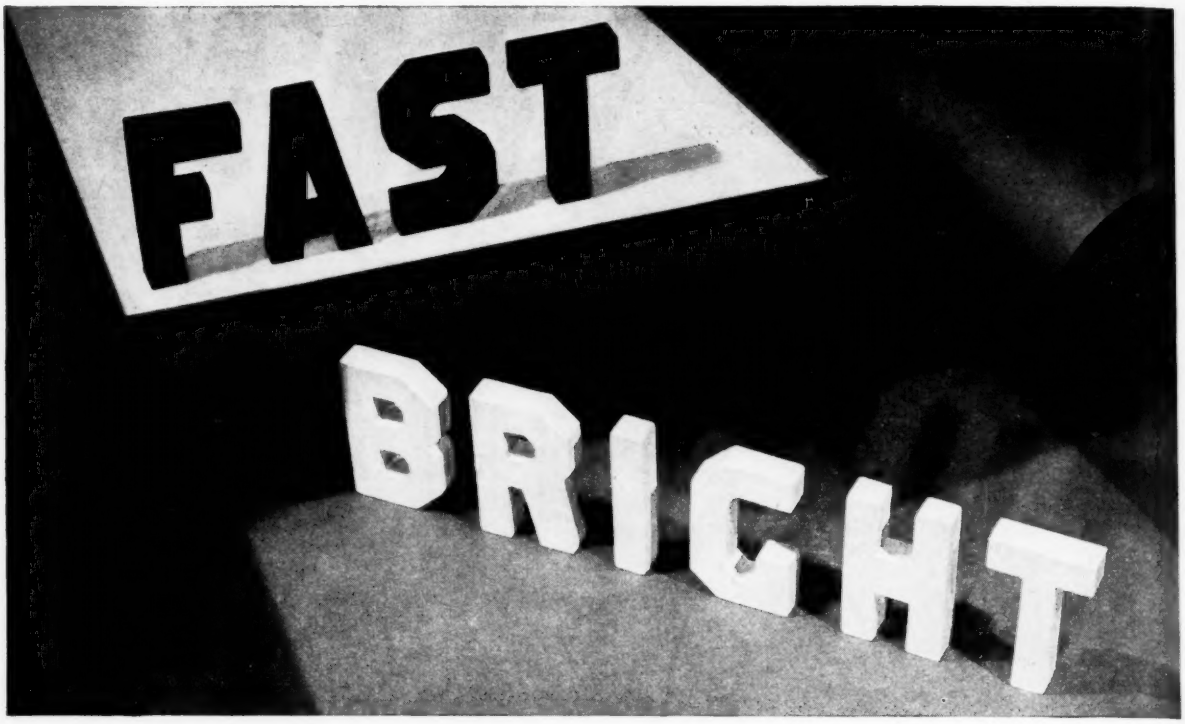

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Use and Misuse of Chlorine in Textile Bleaching

By W. L. SAVELL and J. W. IVEY

The Mathieson Alkali Works, Inc.

THE use of chlorine, usually in the form of hypochlorites, for bleaching vegetable fibers has been known and practiced for more than a hundred and fifty years. Its advent as a bleaching agent was welcomed by the early textile manufacturer because it freed him from dependence upon the most uncertain and unsatisfactory use of sunlight for this purpose.

Continued and expanding use of chlorine in textile bleaching is the result of the natural advantages which it offers—economy, convenience and remarkable flexibility, which no other bleaching agent offers to the same degree. And somewhat paradoxically these very advantages form the greatest handicap to the development of the most efficient and satisfactory methods of application.

Because chlorine bleaches are inexpensive it is common practice to depend upon the bleaching to correct the failures of previous operations. This is usually done by overbleaching or re-bleaching, which amounts to the same thing. The practical effectiveness of such handling with such a low-priced reagent removes the incentive to study the conditions sufficiently to establish the most economical and efficient methods of use. At this time, when the effect of overbleaching upon the fiber strength is beginning to be understood it is likely that more attention will be given to the preparation of goods for the bleaching operation.

The particular properties of chlorine bleaches make it feasible to use them under a greater variety of conditions of temperature, composition and process than would be possible with any other known bleaching agent. Temperatures from atmospheric (cold) to 130° F. are in use. Strongly alkaline to slightly acid hypochlorites, including calcium hypochlorites are found in the established practice of various plants. Process operations vary from batch treatment by submergence in cold bleach liquor for a period of hours or until the desired color is obtained to continuous bleaching of yarn chain and piece goods at 120° F. where the bleaching is finished in twenty minutes. Padding with cold bleach liquor and piling is common in many other plants.

While these virtues of the chlorine bleaches make them remarkably dependable under practically any conditions of use they have at the same time caused the technical operator to neglect the opportunities for discovering the most desirable methods of application in many cases. And it is because of these very virtues that the bleaching operation has been so largely abused and misapplied as something of a cure-all for the various manufacturing difficulties encountered prior to this operation.

Like most industrial processes bleaching was carried out practically, long before any of the chemistry of the treatment was understood. And even today we are not fully acquainted with the reactions which occur while bleaching textile fibers. It is known, however, that cotton fiber in the raw state has associated with it a number of non-cellulosic materials including pectins, waxes and oils. A brief inspection of these materials in the light of elementary chemical knowledge indicates the advantage of removing as much as possible of these bodies before attempting to bleach the fiber. Such removal is even more imperative in the processing of manufactured or partially manufactured materials such as yarn or piece goods containing sizing compounds.

In treating sized goods the starch is usually rendered soluble by means of acid or an organic reagent composed largely of enzymes. At this point it may be interesting to note that hypochlorites also have the property of solubilizing starch. The pectins, waxes, natural and mineral

oils depend upon proper boiling-out for their removal. Since they are not directly soluble it is necessary to emulsify them so that the boil-off and scouring liquor will carry them away from the fiber. Also because of the low chemical activity and the water-repellent nature of the oils and waxes, considerable attention must be given to the wetting-out of the material to insure thorough penetration of the fiber by the reagents used. Care exercised at this point not only results in cleaner goods but less bleach is necessary in the final operation and the tendency to weaken the fiber by oxycellulose formation is very considerably reduced.

The difficulty of penetrating the fiber with boiling-off and scouring liquors has brought forth a host of special wetting-out compounds to assist the operation. Of these probably the oldest is turkey-red (sulphonated castor) oil. Many other wetting agents have been proposed including Tetrain (tetrahydronaphthalene), Declain (decahydronaphthalene), Hexalin (cyclohexanol), cyclohexyl acetate, alcoholic soap solutions containing 87% of trichloroethylene, ammonium linoleate, soaps and numerous others. A number of them are being used with various degrees of satisfaction as proprietaries under special trade names. Whatever their composition, their usefulness depends upon their ability to emulsify the non-cellulosic compounds attached to or contained in the cotton fiber. Generally speaking, to be most effective the agent should be soluble in the liquor used and have a positive solubility for the oils and waxes.

While the proportion of wetting agent used is limited by consideration of costs, its function is of great importance to proper processing and a final choice should be made only after careful investigation has proven that its properties make it suitable for use.

Many boil-off reagents have been suggested from time to time but straight alkali usually in the form of a 2% to 3% caustic soda solution forms the basis of the most generally satisfactory liquor for this purpose. Occasional advantage may be noted in the use of small amounts of sodium silicate for protecting metal kiers. For milder boiling action soda ash is sometimes used. However, if the gray goods are considerably specked with motes it is usually necessary to use caustic soda for softening them for removal or bleaching. In actual practice various mixtures of soda ash and caustic soda are used and in certain cases, operators are mixing compounds containing sodium bicarbonate. This latter practice is faulty as the emulsifying or scouring properties of the bicarbonate are so limited as to make the operation a waste of material.

The nature of the goods and the requirements determine the pressure and duration of the boil-off. Satisfactory operation is usually between eight and twelve hours, with steam pressure between fifteen and twenty pounds.

In boiling out goods containing yarn-dyed stripes or figures, the open boil is used. In order to use straight caustic soda for this type of material it is necessary to add to the boil-off liquor a mild oxidizing assistant to prevent the vat dyes from reducing and marking off or staining the white portions of the goods. The most satisfactory reagent of this type is a nitro-phenol compound marketed under a trade-marked name. The use of such a compound makes it possible to use the single caustic boil instead of the slow two-boil process with soda ash.

As a final step in the preparation or "bottoming," the goods must be carefully rinsed. This removes the matter dissolved or emusified in the previous step. Here again it is necessary to use care to insure a complete removal of the liquor carrying the impurities or they may be reprecipitated on the fiber in the form of insoluble soaps and grease spots. At this point, it is very desirable to have soft water for rinsing if possible. If no soft water is naturally available soda ash or caustic soda should be added until the water is faintly alkaline (pH 8.) to avoid the formation of lime and magnesium soaps for this source.

As indicated above the make-up and methods of applying chlorine bleaches cover an extremely wide range. One feature they all have in common today, however, is that they are practically all prepared with liquid chlorine. This is interesting in view of the statement made by A. J. Hall in the Reports of the Progress of Applied Chemistry in 1925 to the effect that "it is doubtful if liquid chlorine is suitable or cheaper for use in any except very large bleaching works." And, at this time, there is only one rival of liquid chlorine on the horizon. This is in the form of true calcium hypochlorite containing 65% available chlorine—a new product which is being marketed under the trade name H T H.

The preparation of chlorine bleach liquors is very simple and generally known. Briefly, it consists of dissolving chlorine in a solution of alkali. The liquor best adapted to general use is made by dissolving chlorine in caustic soda solution. Sufficient caustic is used to neutralize all the chlorine added and allow an excess alkalinity of an amount determined by requirements. If a normal bleaching action is required one hundred pounds of chlorine is dissolved in a caustic soda solution containing one hundred and fifteen to one hundred and twenty pounds of caustic soda depending upon the purity. For a rapid bleach the excess alkalinity may be supplied in the form of soda ash. This type of liquor depends upon the decreased stability for its increased activity. In the earlier period of chlorine development some mills chlorinated straight soda ash solutions. This procedure is wasteful of alkali as may readily be seen from the nature of the chlorinating reaction:

$$2\ Na_2CO_3 + Cl_2 + H_2O = NaOCl + NaCl + 2\ NaHCO_3$$

The waste of alkali results from the fact that one half of the soda ash used is converted to bicarbonate. The bicarbonate is useless for preparing hypochlorite since the acidity developed by the release of carbon dioxide in the chlorinating reaction will cause the hypochlorite to decompose spontaneously:

$$2\ NaHCO_3 + Cl_2 = 2\ NaCl + H_2O + 2\ CO_2 + O$$

This decomposition proceeds rapidly when once started

and will continue until the entire batch is broken down. For this reason sodium bicarbonate is unsuitable and unnecessary as a constituent of bleach liquors.

The first requirement of a satisfactory bleach solution is a suitable content of hypochlorite. This may be formed most economically by the chlorination of caustic:

$$Cl_2 + 2\ NaOH = NaOCl + NaCl + H_2O$$

In this reaction a minimum of materials is used and only the direct products of the reaction are formed. Excess alkalinity may be supplied either in the form of soda ash or caustic soda depending only upon choice. The best control of the hypochlorite activity is most economically obtained by properly balancing the ratio of chlorine and caustic soda. While it is essential to have some excess alkali present, it is quite possible to so adjust the chlorination as to leave only a very slight margin above the quantity actually required for the hypochlorite formation. In this manner the solution activity may be increased to the maximum without seriously affecting the stability of the cold stock solution. This simply means that the nearer the quantities of materials approach the theoretical ratio of 100 pounds of chlorine to 112½ pounds of caustic soda, the more active the solution will be. In using a commercial grade of caustic having a purity of 98%, the complete chlorination would show a ratio of 100 pounds of chlorine to 115 pounds of caustic soda. If the purity of the caustic is lower than 98% a correspondingly larger quantity must be used.

Contrary to the widely-accepted idea, large excesses of alkali in any form do not increase the stability of the solution. Such excess alkalinity may modify the bleaching activity but will add nothing to the stability of the stock solution.

Stock solutions in the majority of mills are made at a concentration of approximately 30 grams per liter of available chlorine. This concentration is convenient because the increase in temperature during the chlorination is small enough to permit rapid make-up under all ordinary conditions without exceeding the reasonable finishing temperature. However, it is quite possible to make up solutions of 50 grams per liter and still remain within a satisfactory temperature limit. In making up a solution of 30 grams per liter available chlorine the greatest possible increase in temperature would be 18° F. Starting with a caustic soda solution at 70° F. would give a maximum of 88° F. To make up a solution of 50 grams per liter starting with the caustic soda solution at 70° F. would mean a maximum finishing temperature of 100.7° F. Recent investigation has shown that this higher temperature is not destructive to the hypochlorite finished in this manner. Moreover, there is a certain advantage in increased stability incidental to the higher finishing temperature. Metallic impurities such as iron, always present to some extent in the water or caustic soda, are more completely preciptated from the solution at the higher temperatures. As these impurities are largely responsible for the decomposition of many solutions, their elimination is highly desirable.

In actual practice the temperature increases named above will seldom be reached. Radiation and absorption by equipment will account for a large part of the heat of reaction so that the actual increase in the majority of make-up tanks will be less than the figures given above. In this connection it may be useful to mention that the temperature increase will be constant for any given condition and may be used to control the chlorination. It is only necessary to establish a standard practice and note the temperature change during chlorination. With a good thermometer the progress of the chlorination may be easily followed and the point of complete chlorination may be accurately determined by the operator. Original temperature observations should be checked by analysis.

Aside from the advantage of finishing at a higher temperature, the use of stock solutions of 50 grams per liter available chlorine makes it easier to control the excess alkalinity of the bleach liquor. As the actual weight of excess alkali necessary is not greater in the higher concentrations than in the lower, this means a small saving in alkali as well as better control of bleach liquor composition.

Careful control of the bleaching operation, which involves control of bleach liquor composition, is one of the most important requisites of successful textile manufacture. As previously indicated, it is not necessary or desirable to use unstable hypochlorite solutions to obtain a rapid bleaching action. The greatest efficiency and economy is attained by proper adjustment of excess alkalinity in the form of caustic soda. As the excess alkalinity is reduced the bleaching activity is increased but without serious loss of stability. Unstable hypochlorite solutions are more likely to affect the fiber strength by formation of oxy-cellulose than the stable solutions and there is no compensating advantage in their use.

There has been much research in the laundry industry over the past few years particularly in connection with the bleaching operation. The importance of this operation is greatly increased in laundries since it is necessary to handle the same textiles repeatedly without damaging the fiber. Naturally enough the lack of bleaching control was found to be the most potent factor in accounting for unusual loss of fiber strength and general damage. Proper control of bleach composition and use has established the fact that cotton textiles may be washed and bleached from forty to sixty times without seriously impairing the serviceability of the garments.

The advent of the stable calcium hypochlorite H T H is probably the most important contribution to the successful solution of the problem of controlled bleaching in small operations. It is the logical answer to the laundry problem as it makes it possible to prepare stable sodium hypochlorite solutions of known concentration with a minimum of effort and equipment. The high available chlorine content (65%) and low residual alkalinity provide the optimum conditions for practical use.

For small mills or in mills that bleach only occasional lots of goods, the new compound is the best available

reagent. It may be retained in storage over long periods of time without noticeable deterioration. Dissolved alone it forms a very stable calcium hypochlorite solution of low alkalinity. By treating the calcium solution with soda ash in a ratio of 100 pounds of H T H to 75 pounds of soda ash, a sodium hypochlorite is formed. In this latter operation, a small amount of calcium carbonate is formed which settles rapidly. The sodium hypochlorite solution is also very stable and of low excess alkalinity.

Rayon mills have found these solutions particularly useful because of their properties and the ease with which the available chlorine content may be controlled. Bleachers and dyers confronted with the re-dyeing of acetate rayons are applying H T H as a final bleach after stripping.

After bleaching, the remaining traces of hypochlorite are removed by treatment with an anti-color such as sodium bisulphite or an acid, usually sulphuric. This treatment is normally preceded by a good rinse in water.

Varying conditions in different mills may create a preference for one or another type of reagent but for most processes a solution of sulphur dioxide (sulphurous acid) is probably the most effective anti-chlor and sour combined. In the reaction between bisulphite or sulphur dioxide solutions and the small quantities of hypochlorite remaining in the bleached and rinsed goods, certain quantities of sulphuric acid are formed. For this reason a final rinse is just as necessary when using them as it would be in the case of sulphuric acid used alone.

The complete removal of salts and acids from goods to be finished is imperative. If not removed completely they not only interfere seriously with finishing equipment and process but also damage the goods permanently either in color, texture or strength and usually in all three ways.

During the past few years many improvements have been made in the more progressive mills in establishing proper control in the various steps of textile manufacture. Such control should apply especially to the bleaching operation—in the make-up as well as the use of bleach liquors. In mills having an adequate technical staff this may be done quite readily in handling bleach liquor made from chlorine and caustic soda. For smaller mills, the obvious answer to proper control is the stable calcium hypochlorite H T H.

There is probably no quality in textile materials more important than finish. By the same token, there is no more important step in finishing than the bleaching. The fact that this operation is so relatively inexpensive and so very flexible is not sufficient reason for neglecting the use of proper control of materials, make-up and use. No other part of the finishing process will show greater returns for intelligent attention to this control.

Improvements in Jigger Dyeing

New Ideas On Machines With Removable Vats

By **RAFFAELE SANSONE**

THE organization of the greater portion of the large jigger plants makes it very difficult to work under sufficiently economical conditions for having a decent profit on the prices arranged by the different clients. This condition is due to the great loss of time that follows with:

1. the running off of the old baths;
2. the necessity of sometimes emptying out the old baths by means of large copper or brass spoons or ladles;
3. the cleaning of the dyevats and rollers;
4. the entrance and taking out of the batches of cloth;
5. the preparation of the new dyebaths, etc.

The running off of the old dyebaths, although it may seem, on a single jigger, a quite rapid operation, when repeated on twenty or fifty of such machines several times in the course of a day, represents a quite important factor for absorbing the time of labor. The work is unnecessarily complicated, as the different liquids have to be run into the waste water main, or into tubes leading to under-placed collection cisterns, of which there are many, unless some of the old dyebaths have to be mixed, which renders more difficult their utilization at a later time. Such operations as raising the old dyebaths by the assistance of large spoons or ladles into buckets or truck-cisterns that have to be brought to collection pits or vats, represent an extra cost, also there is the continual danger of spilling on the flooring of the dyehouse. If a great number of jiggers is at disposal, the old dyebaths are left in the respective vats until they are required for a new treatment to be conducted with the same colors and shades, or in shades that differ little from these. The utilization of the plant is, however, ex-

ceedingly irregular and unsatisfactory, and the space over which it is to be distributed quite large. Besides this, it may not always be necessary to dye in the same shades and colors, and the old baths must be thrown away after a certain time, owing to the evaporation of water, the mixing with other colors, etc.

The cleaning of the jiggers is often hindered by the position of the upper moving rollers, by the binding rollers in the dyebath, and by the heating coils under the latter. For eliminating all the coloring matter that has remained fixed during a preceding dyeing, it may be necessary to boil for some time with a weak carbonate of soda bath, and when this is not sufficient, to scrub with a hard brush and a limited quantity of a convenient sand soap. The cleaning must be followed by a thorough rinsing with an abundance of cold running water. Even the most capable dyers lose a certain number of minutes in this way, and only a limited number of lots can be dyed during a working day, unless the dyeing operations are conducted in a continuous bath with dark or medium colors. In this case a slight staining of the material through colored rollers can bring little difference.

The entrance of the different batches of cloth is an operation that also takes time. Even if the workpeople use the precaution to run through the tying strings before stopping the machines, and tie their loose ends at once to the beginning of the material as they take it off the jig after coloring and rinsing, the time is considerable. This admitting that the trucks with several rolls of the untreated cloth can be brought quite close to the jiggers, and can be used later in this condition for collecting the dyed material.

The preparation of the new dyebaths is another operation that reduces the producing capacity of the jiggers, as the workpeople have generally to leave the dyeing room for collecting, in copper spoons, the colors they require for each shade, and that may be in a more or less distant portion of the works. They then dissolve the dyes in hot water under steam tubes.

An Improvement

It is the wish of most dyers to keep unchanged the conditions in the dyehouse, basing the success of the coloring operations principally on their own zeal, perseverance and capacity, and on a good exploitation of the plants already in use for many years. A similar arrangement causes the jigger to be considered as an accessory element, and not as a most essential means for obtaining success. So strongly has this conception been rooted in many of the present dyehouses that some of the recent improvements introduced by the more enterprising machinery works that could have brought a pecuniary advantage, have been neglected, remaining the privilege of only a limited number of firms.

The present serious difficulties, caused in great part by a strong intensification of competition on all the world's markets, renders a re-study of the question a matter of vital importance. A rational transformation that tends to increase the production, bringing special other advantages, should not be neglected, as in the long run it can be also of great advantage to the dyers themselves, reducing many of their present troubles caused in great part through the continual need of bringing lower and lower the cost of the different treatments.

There is no doubt that a great improvement would be the possibility of removing the dyevats after each dyeing operation. Much of the time wasted, as indicated above, would be saved, and more attention could be given to the dyeing operations than is possible at present, even with the very best mounted and directed series of jiggers. Two types of jigger plants with displaceable dyevats can be constructed, those with the dyevat entirely removable, and those with them partially removable.

Jiggers with Entirely Removable Dyevats

In Fig. 1 is shown a special type of jigger plant in which the dyevat is constructed in the form of a small wagon easily entered with its load of liquid for

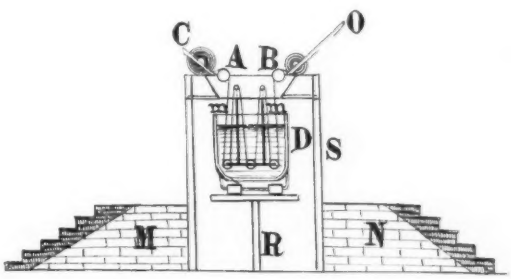

Fig. 1

the treatment of the goods, or withdrawn after this. The fixed portion is constituted in this instance of a light iron stand or framing S, having four legs of a certain height, and a pair of narrow upper rectangles kept at a fixed distance apart from one another by four light iron bars. Between such rectangles are placed the two porcelain moving rollers A and B, on one of which is entered the roll of cloth, while the other serves for an empty wooden beam; both being kept in position by the pair of inclined side arms C and O.

Under the two moving rollers A and B is a pair of upper guiding rollers of much smaller diameter, turning loosely in ball bearings. The bottom of the narrow rectangles has fixed, a pair of copper plated iron bars m, m, joined at their bottom to two light frames of the same material and supporting three narrow diametered glass binding rollers for keeping the cloth at the bottom of the dyevat D during the dyeing.

When dyevat D is lowered to the bottom of the plant, the three lower binding rollers remain an inch or two above and can be removed without hindrance, leaving exposed the whole of the cloth under the mov-

ing cylinders A and B, or the fixing strings if the first has been completely wound above one of these. The small wagon-dyevat D is of rectangular shape, and is of the medium height of most jigger vats. Its capacity is, however, somewhat larger. The interior is lined with copper, and at the bottom is placed a large-sized copper discharge tap. The four wheels of the latter have their shafts in ball-bearings, and they move easily on a pair of rails on the rectangular platform R that is raised or lowered by hydraulic pressure or other convenient means. When platform R is in its lowest position its rails correspond with another pair in front and another pair at the back, to which the small wagon-dyevat can be easily moved. By means of the rails placed in front, the baths of treatment are caused to pass of their own accord on to the rails on the platform, and when the wagon dyevat is pushed to the rails at the back, it runs of its own accord to the deposit for old baths. Other conveniently-placed rails serve for bringing whatever is required in the works.

At both sides of frame or stand S are placed the two low platforms M and N, that are just high enough to facilitate access of the operatives to the top of the jigger. The platforms are of red bricks covered over on the outside with white tiles. The stairs leading to their top are of stone or concrete.

The heating of the different dyebaths is conducted automatically with hot air when the dyevat is placed in position below the guiding rollers. A cone at the end of a tube advances and fills a perforation leading to the enclosed space in the binding roller plate. All excess of hot air makes its way out by a conveniently-placed valve. The temperature produced in the dyevat is regulated by opening or closing a tap in accordance with the indications of a suitably-placed thermometer. The number of times the cloth is to pass backwards and forwards in the dyebath is arranged before initiating any treatment, by moving a short hand-lever that marks off on a scale running from 1 to 20. When the necessary number of times has been completed all movement is stopped automatically on the machine, and an electric bell rings to attract the attention of the operatives.

Work on the Plant

The work on the above plant would not be specially complicated, and could be as follows when starting the treatment of a new lot just an old lot had been taken out. The small wagon-dyevat is lowered and pushed on to the rails for sending to the deposit, and the binding rollers and moving cylinders thus remaining free, are given a rapid cleaning with a little hot soda lye or old soap bath; rinsing at once after this with an abundance of clean cold running water. All this is done without taking off the strings that have been left from the preceding dyeing operations. The new lot of cloth to be treated can be introduced at once and its first end fixed by tying with the strings.

When the above has been completed, a telephone call is made for the delivery of the small wagon-dyevat with the bath for the treatment. The bath soon arrives by the rails already indicated, and enters in position on the platform R. This is then raised, and the plant is placed in movement after having regulated the number of passages to be given. The heating of the bath then takes place automatically while the fabric is passing backwards and forwards, ceasing as soon as the machine is stopped. Before the vat is lowered the fixing cone has been withdrawn, leaving the vat quite free.

The operative in charge can then leave to enter another lot of cloth on a neighboring machine. The empty beam turns with the moving cylinder just below, and receives the cloth as each portion is passed through the dyebath, forming a roll of continually increasing size, until the time is reached when all the material has entered, and begins to pull the strings fixed to the wooden beam on the opposite side of the machine: This causes the moving cylinder above which it rests to reverse its movement and results in the material winding again on the beam from which it has been unwound. Here is then formed a second roll, that when complete is unwound again for forming a third roll, the movement being continued in this way until the required number of ends have been given. At this point the stoppage motion functioned and as soon as the beginning of the tying strings has mounted on the last beam to be filled, the machine comes to a standstill.

The ringing of the bell then indicates the stoppage of the plant and calls the attention of the operative. He then has to lower the small wagon-dyevat and send it to the deposit. The lot of colored cloth is taken off by two boys or girls and the guiding and moving elements of the machine are washed before entering further material.

Great care is necessary in the preparation of the different dyebaths, for the slightest mistake can bring about the production of unfortunate shades. The small wagon-dyevat has a fixed weight, and in it is weighed the water used in each case, and that is regulated exactly to the pounds and ounces of fabric to be treated. The quantities of dyestuff required for each shade are then easily calculated, and the above danger is avoided if the colors employed are of uniform strength.

Advantages of the Plant

The above plant has several important advantages, some of which can be indicated as follows:

1. The cloth can be rapidly entered on the guiding and moving cylinders by two boys or girls standing on the raised floors M, N.

2. A pair of boys or girls can charge the cloth to be treated on a large number of jiggers in a very short time.

3. The small wagon-vat serving for the dyeing operations is so constructed that it will resist many years of use.

4. The different dyebaths or other baths of treatment are prepared in a separate room to where the dyeing is conducted.

5. If the different baths are prepared after trials conducted in the laboratory, and the rolls of cloth are weighed, basing the quantity of liquid, dyestuffs and fixing or exhausting agents on the pounds and ounces registered, there is less danger of making mistakes in the shades produced.

6. As a supplementary guarantee, all the dyebaths can be tested before delivering in the dyehouse by taking 50 cubic centimeters, boiling in this for ten minutes a weighed quantity of the cloth to be treated later on a large scale, rinsing rapidly with cold water, pressing between a clean pair of india-rubber rollers, and drying and comparing with the sample to be matched.

7. The raising and lowering of the small wagon vats, and their delivery and entrance to platform R takes place automatically, as does the delivery of the old baths to the deposit, where they are to be re-utilized whenever the opportunity offers itself.

8. The heating of the contents of vat V takes place automatically with hot air when the dyevat is placed in position below the guiding rollers and the latter are placed in movement, ceasing as soon as all movement is stopped on the plant.

9. The cloth receives three dips in the bath during each passage backwards and forwards which increases considerably the efficiency in comparison with the majority of ordinary jiggers.

10. The number of turns to be given to each roll of cloth is regulated from the start and is executed without the operatives having to be present. Attention is drawn to the machine when it has stopped of its own accord and the goods are ready to take out.

11. The rinsing operations are conducted on a separate jigger, or on a continuous machine, where water reaches the material from many spurting pipes.

12. The arrangement of only conducting the dyeing operations on the machine, reserving for elsewhere any further treatment or the rinsing; the rapid entrance and exit of the material; the specially intensive treatment; the speedy taking out; and the rapid supply and exit of the baths for treating, increase considerably the production of the plant.

A Plant for Double Treatments

The above plant is certainly a marked improvement, and through its means a great saving is possible in the dyeing operations conducted in a modern dyehouse. If it should, however, be required to enter the whole of a roll of cloth to be treated from one side in one operation, conduct the dyeing of two batches of cloth one after the other, or treat one batch with two baths, the plant shown in Fig. 2 is of particular value.

Here is to be seen a high cloth framing F, at one side of which is placed a raised pavement R, for the operatives to stand when entering or taking out the rolls of cloth before and after the dyeing. Its top is divided into two sections, one for conducting all the aging operations, and the other for a supplementary dyebath, a rinsing bath or any other bath that may be necessary. Above the first is fitted a pair of inclined rails S, having between them the moving rollers m and r, which function like those on the most advanced jiggers. That is, when one is moved by the mechanism driving the machine, the other turns loosely on its axles, remaining under the action of a brake that maintains the necessary tension on the fabric. Besides this, the mechanism itself brings its action from one moving cylinder to the other through the simple pulling of the cloth. On the two upper moving cylinders and the empty wooden beam on which the cloth is to be wound during the first run across the dyebath the operative has no difficulty in placing the roll of cloth. For facilitating the entrance of the pair of strings and avoiding loss of time, the wooden beams are supplied with entrance slots at each extremity.

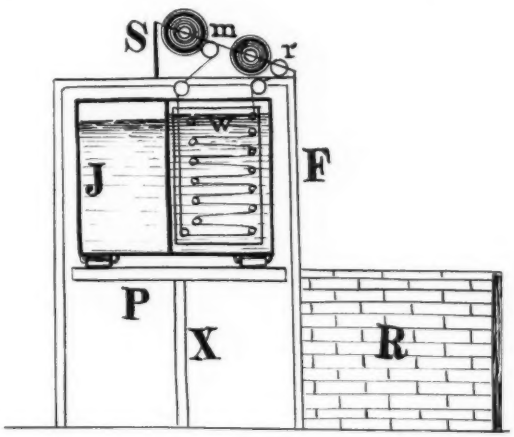

Fig. 2

A means is supplied in this instance for utilizing more intensively the action of very short dyebaths. This consists of a copper covered iron plate having twelve glass guiding rollers on both sides of the length of the widest piece, and placed as indicated in the figure, so that the material when coming from an upper guiding roller on the right and moving roller r, is obliged to form a spiral while descending to the bottom of the bath. After this it passes to a single roller for mounting upwards and then makes its way through an upper binding roller on the left to moving roller r.

The interior of plate r is hollow, and in the space enclosed is circulated through a special arrangement in the plant, the hot air necessary for the heating operations. The hot air is entered automatically when the moving rollers are caused to revolve, and suspended when they are stopped. Here also is regulated the number of passages to be given the cloth. After the machine stops automatically, a bell rings to call the attention of the operative in charge.

A double wagon vat J is supplied. It is raised or lowered for entering the double cloth guiding arrangement w in one of the compartments with the greatest

facility and rapidity. This is done by simply placing in movement a small plant at the back, worked by hydraulic pressure, and which moves platform P by the assistance of the steel tube X. The delivery of wagon-vat J from the bath preparation chamber to platform P, or from this to the deposit for old baths, is conducted in about the same way as with the plant prevously described.

All the glass rollers on the double guiding arrangement are so disposed that they turn freely in carefully constructed water-tight bearings, maintaining a certain rigidity all through. There is no danger of their moving out of position in the unfixed portions because of the hollow metallic plates on both sides. The double wagon vat runs on rails in platform P. The rails are at a certain distance apart and correspond with pairs of rails at the back and front of the machine. The back rails lead to the deposit for old baths while the front rails connect with the department where the preparation of the bath takes place. The bath, therefore, always arrive in a warm condition so that little extra heating is required with the hot air. The degree of heating conducted by this last is regulated by opening or closing a small tap that marks off the number of quarts per minute on a semi-circular register of porcelain, and the operative arranges it after controlling the temperature of the baths received from the preparation department with a thermometer.

Work on the Plant

Work could be conducted as follows on the above plant: The wagon vat from a preceding dyeing is lowered and the two rolls of dyed cloth wound above one of the moving cylinders are taken off leaving the strings fixed to the empty wooden beams still present on the jigger. When this has been accomplished, the operative subjects such beams, the moving cylinders and all guiding rollers to a rapid cleaning and enters the pair of rolls of cloth to be next dyed, placing these side by side.

If the strings for some reason or other have been broken and do not therefore pass on all the binding rollers on both sides of the hollow plate w, new strings are rapidly substituted. Such cases should however rarely take place if the operative in charge changes the strings whenever there is the likelihood of breaking.

When the two rolls of cloth have been entered, a telephone call is made for two dyebaths that are received soon after. They are then rapidly raised in the machine, and one of them wets the double series of guiding rollers and the strings. Electricity is switched on at the small electric motor used to move the upper and lower guiding rollers. In this way the cloth enters the dyebath, and is carried through at the speed that has been arranged, and which varies in accordance with the nature of the material treated, being slower with the thickest articles and more rapid with the thinner. In the meanwhile the hot air enters in the space enclosed by plate w, and adds to the bath the necessary heat for reaching the desired temperature. The necessary number of passages is then given to the material.

The two lots of cloth are colored in this way to the desired intensity of shade by the time the machine is stopped, and can be withdrawn, leaving in the strings, after having lowered the wagon vat. This is brought on a turning plate to the front rails, where the compartment with the unused bath is brought in the correct position for serving in the next dyeing operation. After this the same operative, or an assistant of his, enters another two rolls of cloth, after washing rapidly the guiding rollers and upper treating elements of the machine.

The wagon vat is then raised and the cloth is run through by again starting the machine. The second double lot is thus ready after the necessary time of treatment for taking out. While this last operation is being conducted the wagon is sent to the old bath chamber and replaced by another with two fresh dyebaths. Through this arrangement, in the course of a day's work quite a large number of rolls of cloth can be dyed in the most different colors and shades and no inconveniences arise if there is a suitable organization in the preparation chamber and the head operative there is assisted by a capable colorist with the necessary laboratory and experience.

Work on the Plant

The above plant has several very important advantages, some of which can be indicated as follows:

1. Two lots of cloth are dyed with one bath to exactly the same intensity of shade if they are of the same nature and have an identical coloration in the untreated state.

2. If the rolls of cloth are only dyed the production of the plant is very strong, while if they are after-treated or rinsed it is halved.

3. If the supplementary or second compartment in the wagon vat is employed for rinsing operations, there is also the inconvenience of the water having to be entered from above and delivered out through a lower tap, although it is useful with the colors requiring to be freed at once from imperfectly fixed dyestuff.

4. Each two rolls of cloth are treated in a very short bath, under so intensive conditions that the dyeing can be conducted, in many cases, more rapidly than on ordinary jiggers.

5. Through the adoption of the two-compartment wagon vat the work of the operatives is much simplified in the preparation room, as the two solutions required in this case can be prepared simultaneously by bringing the latter under a special arrangement from which two heating coils are lowered.

6. The heating is conducted just sufficiently for arriving at the correct temperature in the baths for the dyeing operations by using the hot air under the most convenient conditions.

7. The number of passages to be given to the two lots of cloth is regulated in advance by a special arrangement that also stops the machine when the whole of the material has been wound on the wooden beams on the right or left of the machine.

8. The two rolls of cloth are entered only from one side of the plant and from a raised stone flooring, and the operative in charge can observe with the greatest ease the color of the cloth as it starts each passage, and its intensity during or after the last.

9. If required, the plant can be prepared with wagon vats having four compartments instead of two, permitting the dyeing in four separate colors, during two treatments, only two, or only one.

Jiggers With Partially Removable Dyevats

There are cases in which the arrangement of small wagon-dyevats just indicated may not satisfy the particular requirements of the works. There, a plant with partially removable vats of the type indicated in Fig. 3 may be preferred. This has a light iron framing F, of the most convenient height for the operatives, and supplied with four legs joined to an upper framing with the inclined arms a and c, through which is entered on one side the roll of cloth to be dyed, and on the other the empty wooden beam for winding during the first passage in the dyebath. In the center of the upper frame is a special arrangement through which two square sectioned rods can be raised with a single lower binding roller that remains towards the bottom of one of the vats A, B, C, to be used for the treatment of the goods, or raised sufficiently high above this for permitting its removal without any interference. The single binding roller is of copper plated iron, and of large diameter and perfectly cylindrical shape. Its interior is hollow in order to give the required lightness. It moves easily in conveniently located water-tight bearings.

The two vats A and C are double walled, and have a narrow round bottom in the interior that is a little larger than the lower half of the binding roller. B has only one wall. Vat A and C are of good height for containing sufficient dyebath for coloring rapidly the cloth run through, and they are fixed together with vat B to endless iron bands, moved by the large diametered pairs of wheels Q and R, kept in position by iron bars, one of which is indicated by M.

In this instance vats A and C serve for the dyeing operations, and vat B is only employed for rinsing purposes. It is about twice as wide as the other two, and when entering in position below framing F it receives automatically a supply of water which continues its entrance for five or ten minutes, in accordance with the arrangements made; being stopped after this while the liquid in the vat runs off. When vat A, or vat C, makes its way below framing F, the large binding roller is lowered in it automatically, and a supply of hot air is entered between the double walls for adding the necessary heat. The moving rollers m and o then start, without the interference of the operative, the cloth passes backwards and forwards for the number of times arranged.

The moving rollers m and o do not turn continually on their axles as is usually the case, but move a slight interval, then stop, repeat the movement for the same interval, and stop and continue in this way until the cloth comes to pull on the empty beam through the strings and reacts on the moving cylinder below. The direction followed by the cloth is then reversed. The cloth then makes its way again to the beam from which it has been first unwound, continuing the passage backwards and forwards until the completion of the dyeing process. The guiding roller then rises out of the bath, and the machine stops of its own accord.

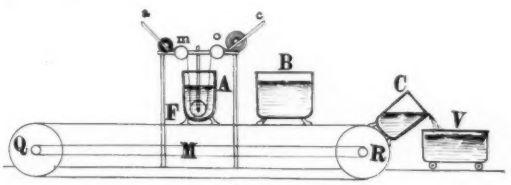

Fig. 3

The lower portion of the two endless iron bands turn in a channel below the flooring of the works, however, never for a full revolution, for they are to serve principally for bringing the one or the other dyevat, or the rinsing vat, below the cloth-treating frame, or to empty out, as shown in the figure, the contents of the dyevat on the right, or of the dyevat on the left, into a small deposit wagon V, which is then conducted into the deposit compartment where its contents are reinforced with convenient additions of color and salt and sent back to the dyeing plant to be pumped into one of the vats and used for a next treatment.

Work on the Plant

A way of working the above plant would be as follows:—A first dyebath is prepared with the necessary coloring matters in one of the small wagons, and is delivered into the small vat on the left, indicated by A, through the assistance of the special pump already indicated. The roll of cloth to be dyed is then entered on the treating frame, letting its short end shafts lean on the inclined arms a, while its covering remains pressed against the moving cylinder just below. The cotton or hemp strings, fixed to an empty wooden shaft between the inclined arms c, are then tied to the beginning of the cloth, and the number of passages to be given and the degree of heating to be applied to the dyebath is regulated. The plant is then started.

Dyevat A with its supply of coloring liquid then comes below framing F where the guiding or immersion cylinder is lowered until it nearly reaches the bottom. The hot air enters in the space between the double casing of the dyevat and rapidly warms the dyebath to the required degree.

A certain raising of the dyebath thus follows. The moving cylinders m and o start carrying the cloth at the required speed across the bath of treatment for a short distance and then stop. This motion goes on continually. In the dyebath, the material remains, therefore, continually under the action of this often repeated movement which quickens the penetration of the liquid into the

most internal portions, rendering more easy the rapid production of uniform shades.

During the first passage a certain depth of shade is obtained. The direction is then reversed and the material is rewound on the empty wooden beam. The cloth goes backwards and forwards the full intensity of shade is developed.

At this point the passage of the hot air is suspended, and the immersion drum is raised. The dyevat then makes its way forwards with the endless bands to the left of framing F, being substituted by rinsing vat B, into which an abundant supply of water is at once conducted. Here the immersion drum is lowered, and the cloth is run through the fixed number of times and all entrance of water stops. After the rinsing, if a further treatment is required, the dyevat on the right C is carried below framing F, and the goods come to be treated in it, following with a second rinsing in vat B.

After this the wet roll of dyed cloth is freed from the string tyings and placed on a truck for transporting to the drying department alone or together with other rolls that have been treated on the same or other plants. While the material is being treated with the second dyebath, the first in A is emptied into one of the small transportation wagons, and its interior is rapidly cleaned with a little hot soda and rinsed with abundance of cold water.

Advantages of the Plant

The above plant has several important advantages, some of which can be indicated as follows:

1. The rolls of cloth are treated with one only guiding drum which is easily turned during its passage.
2. The special height of the dyevat employed in this instance, and the large dimensions of the immersion drum, allow a sufficient emersion of the fabric in the dyebath to produce the deepest shades.
3. Through the adoption of the continually suspended movement of the cloth while in the dyebath, the penetration is greatly facilitated.
4. The heating of the dyebaths is conducted automatically and always to the degree precedingly arranged.
5. Matters can be arranged so that the material only enters in the dyebath when it has been brought to the maximum degree of temperature, thus avoiding the danger of dyeing one portion more than another.
6. The goods can be given a single or two dyeings after the necessary intermediate rinsing.

Symposium of Color

At the Joint Meeting of the American Physical Society and Optical Society of America to be held in New York February 26, 27, 28, three sessions will be devoted entirely to color and related subjects.

The sessions Thursday will be held in the Museum of Science and Industry, 220 East 42rd Street, and the Friday sessions in the Physics Laboratory of Columbia University.

All members of the Association of Textile Chemists and Colorists are invited to attend any or all of the sessions.

The program related to color is as follows:

10 a. m. Thursday, February 26, Museum of Science and Industry.

Invited papers on Industrial Color Standards

1. G. F. A. Stutz, Fundamental Research Division, New Jersey Zinc Co. Reflectance Measurements in the Paint Industry.
2. Carl Z. Draves, Technical Laboratory, E. I. duPont de Nemours & Co. Spectrophotometric Measurements in the Dyestuffs Industry.
3. W. B. Van Arsdel, Research Department, The Brown Co. Color Specification in the Pulp and Paper Industry.
4. W. D. Appel, Bureau of Standards, Color Problems in the Textile Industry.
5. A. E. O. Munsell, Munsell Research Laboratory. The Munsell Book of Color.
6. M. Rea Paul, Research Laboratories, National Lead Company. The Dictionary of Color.
7. Margaret H. Rourke, Textile Color Card Association of the United States, Inc. The work of the Textile Color Card Association.

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2 p. m. Thursday, February 26, Museum of Science and Industry.

Invited Papers on Spectrophotometry and the Use of Photoelectric Methods in Colorimetry

8. H. E. Ives and E. F. Kingsbury, Bell Telephone Laboratories. The applicability of Photoelectric Cells to Colorimetry.
9. K. S. Gibson, Bureau of Standards. Spectrophotometry at the Bureau of Standards.
10. Paul McMichael and Monroe Barnard, American Photoelectric Corp. Some Comparative Spectrophotometric Measurements.
11. P. J. Mulder and Joseph Razek, University of Pennsylvania. The Razek-Mulder Color Analyzer:

Part I. General Description Including Recent Improvements. Peter J. Mulder.

Part II. Discussion and Evaluation of Errors in the Instrument. Joseph Razek.

12. Irwin G. Priest, Bureau of Standards. Some remarks on Current Proposals Relative to the Application of Various Photoelectric Instruments to Practical Problems of Color Specification.

10 a. m. Friday, February 27, Physics Laboratory, Columbia University.

Invited papers on Color Specifications

13. Irwin G. Priest, Bureau of Standards. Fundamental Principles of Color Specification.
14. D. B. Judd, Bureau of Standards. Chromatic Sensibility to Stimulus Differences, and Tolerances in Color Specifications.

(Contributed papers on Color Measurements as scheduled by the Secretary, Nos. 15-17).

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

President
P. J. Wood
Oriental Silk Printing Co., Paterson, N. J.

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Lowell Textile Institute, Lowell, Mass.

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Henry D. Grimes, Chairman, Wood Worsted Mills, Lawrence, Mass.
Harold C. Chapin, Secretary, Lowell Textile Institute, Lowell, Mass.

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Richard B. Earle, Chairman, 133 Power St., Providence, R. I.
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Clemens F. Hoppe, Secretary, Oriental Silk Printing Co., Haledon, N. J.

Philadelphia Section—
Charles A. Seibert, 311 S. Riverside Walk, Penn's Grove, N. J.
Percival Theel, Secretary, Philadelphia Textile School, Philadelphia, Pa.

Piedmont Section—
Samuel L. Hayes, Hartsville Print & Dye Works, Hartsville, S. C.
Arthur R. Thompson, Jr., Secretary, 1109 Independence Building, Charlotte, N. C.

South-Central Section—
R. S. Wheeler, Chairman, Crystal Springs Bleachery, Chickamauga, Georgia.
J. D. Mosheim, Secretary, Crystal Springs Bleachery, Chickamauga, Ga.

Midwest Section—
Edward W. Morgan, Chairman, Morgan Dyeing & Bleaching Co., Rochelle, Ill.
William Bergh, Jr., Secretary, Vassar Swiss Underwear Co., Chicago, Ill.

Lowell Textile Junior Section—
Alfred J. Carbone, Chairman; Paul Duggan, Secretary.

North Carolina State College Junior Section—
R. A. Gilham, Chairman E. B. Hardin, Secretary.

CALENDAR OF COMING EVENTS

Council and Research Committees—
February 27—New York.
March 20—Boston.
April 17—New York.
May 15—Boston.

* * *

Exhibition of Color at the Museum of the Peaceful Arts, 220 East 42nd Street, New York. Starts January 2nd and continues several months.

* * *

Symposium of Color in Art and Industry. To be held in connection with the meeting of the Optical Society in New York, February 26th and 27th.

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New York Section Meetings—
February 27—New York.
March 27— Paterson.
April 24—New York.
May 22—Paterson.

* * *

Northern New England Section Meetings—
March 7.
April 4.
May 2.

SEVENTIETH COUNCIL MEETING

THE Seventieth Council Meeting was held at the Engineers' Club, Boston, Mass., at 2:00 P. M., January 16, 1931.

The following were present:

President: P. J. Wood.

Vice Pres.: Wm. H. Cady.

Treasurer: H. R. Davies.

Councillors: George A. Moran, Hugh Christison, Walter M. Scott, Wm. R. Moorhouse.

Councillors ex-officio: Henry D. Grimes, Chairman, Northern New England Section. Dr. Carl Z. Draves, representing C. A. Seibert, Chairman, Philadelphia Section. Prof. L. A. Olney, Chairman, Research Committee.

Secretary: Alex. Morrison.

A letter from Mr. Ralph F. Culver's secretary, with information of Mr. Culver's illness and thus his inability to be present, was read.

The records of the Sixty-Ninth Council Meeting were read and approved.

The Secretary's balance sheet was read as follows and approved.

Secretary's Balance Sheet—

Cash on Hand 12/2/30	$105.40
Receipts 12/2/30 to 1/14/31 Incl.:	
Applications 19 @ $5.00	95.00
1931 Dues 213 @ $5.00	1,065.00
1931 Dues 1 @ $5.04	5.04
1932 Dues 1 @ $5.00	5.00
Corporate Dues	1,425.00
Corporate Application	25.00
Howes Publishing Co.—Reporters	1.00
2 Pins	3.00
Year Book Sale	3.00
	$2,732.44

Disbursements:

1/8/31 Research Fund—To Treasurer	$1,375.00
1/8/31 General Fund—To Treasurer	1,000.00
1/14/31 Research Fund—To Treasurer	75.00
12/3/30 Exchange charge	.75
12/5/30 Exchange charge	.21
12/19/30 Exchange charge	.21
1/6/31 Exchange charge	1.00
Cash on hand Andover National Bank	280.27
	$2,732.44

The Treasurer's report was read as follows and approved:

Treasurer's Report of January 16, 1931, January 14, 1931

GENERAL FUND

Balance Nov. 17, 1930	$5,059.65	
Received since Nov. 17, 1930	2,800.00	
	$7,859.65	
Expenditures since Nov. 17, 1930.	1,773.82	$6,085.83

RESEARCH FUND

Balance Nov. 17, 1930	$3,640.00	
Received since Nov. 17, 1930	1,694.00	
	5,334.00	
Expenditures since Nov. 17, 1930.	726.25	4,607.75
Balance		$10,693.58
Savings Bank	$6,431.21	
Checking Account	4,262.37	
	$10,693.58	

The following were elected to the different classes of membership as noted, as of a date thirty days after the publication of their names if no objection is registered by any member by that time.

66

ACTIVE:

Brenner, R. O.—7401 No. Haynes St., Chicago, Ill. Dyestuff Demonstrator, General Dyestuff Corp., 305 W. Randolph St., Chicago, Ill.

Bowman, Harry E.—312 West 31st St., Chicago, Ill. Chief Chemist, Paris Dyers & Cleaners, 312 W. 31st St., Chicago, Ill.

Furchland, Fred—637 Melrose St., Chicago, Ill. In charge of Laboratory, General Dyestuff Corp., Chicago, Ill.

Goetz, Geo. H.—3730 Rokeby St., Chicago, Ill. Salesman, General Dyestuff Corp., 305 W. Randolph St., Chicago, Ill.

Hiers, G. S.—4343 Dalcota St., Pittsburgh, Pa. Research Chemist, Mellon Institute of Industrial Research, Pittsburgh, Pa.

Morrison, Frank B.—20 Summer St., Pawtucket, R. I. Dyer, Lorraine Mfg. Co., Pawtucket, R. I.

Pickler, M. R.—14 Atwood St., Greenville, S. C. Dyer, Piedmont Plush Mills, Greenville, S. C.

Quig, Joseph B.—Alex. Hamilton Apts., White Plains, N. Y. Sales Service Mgr., DuPont Rayon Co., 2 Park Ave., New York, N. Y.

Royce, Albert J.—8 Garfield Ave., Clifton, N. J. President, Royce Chemical Co., Herrick St., Carlton Hill, N. J.

Schuttig, Charles L.—24 Brewster Ave., Ridgefield Park, N. J. Department Sales Manager & Technical Advisor, A. Klipstein & Co., 644 Greenwich St., New York, N. Y.

Sindt, E. J.—408 Ridge Ave., Evanston, Ill. Chemist, National Aniline & Chemical Co., 357 W. Erie St., Chicago, Ill.

JUNIOR:

Clarkson, Richard G.—2011 Harrison St., Wilmington, Del. Research Chemist, E. I. duPont de Nemours & Co., Jackson Lab., P. O. Box 525, Wilmington, Del.

Hartquist, V. T.—Hollywood Kenmore Hotel, Chicago, Ill. Chemist-Colorist Demonstrator, General Dyestuff Corp., 305 W. Randolph St., Chicago, Ill.

Selya, Herman C.—Y.M.C.A., 160 Broad St., Providence, R. I. Dyer, Franklin Rayon Corp., 86 Crary St., Providence, R. I.

Vanderee, Ralph—56 E. 19th St., Paterson, N. J. Asst. Tex. Chemist, Textile Dyeing Co. of America, Hawthorne, N. J.

ASSOCIATE:

Coate, K. A.—24 W. Union Ave., Bound Brook, N. J. Salesman, The Calco Chemical Co., Inc., Bound Brook, N. J.

Johnson, Elias, A.—1501 Henman Ave., Chicago, Ill. Resident Mgr., National Aniline & Chemical Co., 357 West Erie St., Chicago, Ill.

Kennedy, Patrick J.—65 Central Park Ave., Yon-

kers, New York, N. Y. Dyestuff Salesman, E. I. duPont de Nemours & Co., 8 Thomas St., New York, N. Y.

CORPORATE:

Royce Chemical Co.—Herrick St. & Carlton Ave., Carlton Hill, N. J. Albert J. Royce, Rep., 8 Garfield Ave., Clifton, N. J.

The President appointed the two Vice-Presidents and the Secretary as the Membership Committee.

The Chairman of the Research Committee and Secretary were instructed to take charge of the distribution of Leaflets on Research Work.

Dr. Walter M. Scott, Chairman, Dr. Carl O. Draves, and Wm. D. Appel were appointed representatives of the Association at a Preliminary Conference on Organization of an Inter-Society Committee on Color Specifications to be held in New York February 26, 27, 28, 1931, in connection with the Spring Meeting of the Optical Society of America.

The Secretary was appointed the representative of the Association for the Life Membership, and the Treasurer the representative for the contributing membership in the U. S. Institute for Textile Research.

The Secretary acknowledged with appreciation and thanks flowers sent in the name of the Association during his recent convalescence.

The meeting adjourned at 2:40 P. M. to meet next in New York February 27, 1931.

Respectfully submitted,

ALEX. MORRISON,
Secretary.

Textile Soap

By G. T. HALBERSTADT
Procter & Gamble Company

I WILL attempt to make this discussion of Textile Soaps more or less informal. First I will give you a few general points of discussion, and after that, if there are any questions, we will discuss them. I have here some interesting figures to which I will refer and which I hope will promote some discussion.

You find in the textile plants that the purchasers, superintendents, dyers, chemists and finishers have a great number of ideas as to what they should have for soaps. Thus at the outset there is a question for the soap manufacturer—what soaps should he make and why? During the history of the textile industry, hundreds of different soaps have been offered. I don't know why so many, but it is true. Since the earlier days some of the soap manufacturers have given considerable thought to the subject in order to determine just what soaps are needed. I will give you a general idea of what we, as soap manufacturers, think is needed and what the textile man thinks is needed.

Presented at the October meeting of the Providence Section.

At first the soap manufacturer might be inclined to think that inasmuch as there are four classes of textiles —wool, silk, cotton, and rayon—four classes of soap should be sufficient—one for each textile. That might be a good idea, but it is not practical. Accordingly some of the soap manufacturers have investigated and found that there were more than four soaps necessary for the textile trade. We have found that as the demands of the retail trade became more diverse, the methods of manufacture necessarily became more complicated. These complicated methods of manufacture meant new and improved equipment and new and improved processing methods. We find these methods demand particular conditioning of the textile fibers and particular methods of finishing. To meet these conditions the progressive soap manufacturers have attempted to keep abreast of the industry by manufacturing and offering soaps with properties such that the demands of the mills would be met. At first this seems that a new soap must be offered for every new method of processing in the textile mill. Our studies have shown that this is not true, for quite frequently the same soap gives the best results in entirely different processes. This makes it necessary, as far as the soap manufacturer is concerned, to make a study of the needs of the textile trade and supply only those soaps which are necessary, otherwise he would be hopelessly lost as far as production is concerned. We have done that, and I think I can safely say that at present very few varieties of soap are necessary for the textile trade.

Now the question is, "What properties of soaps make a particular soap adaptable to any particular process?" To fully understand, first we must understand what a soap is. You probably know it is an ordinary salt, just as sodium chloride or sodium sulphate. Chemically it is a compound of a strong base with a weak acid. The strong base is soda, potash or ammonia; the weak acids are oleic, stearic, palmitic, caproic or lauric, or mixtures thereof. The fatty acids are obtained from natural fats, animal and vegetable. The sources of the alkaline portions are the hydroxides or carbonates of potash, soda or ammonia. The properties of the soap depend on the alkali and the fats used in manufacture. Inasmuch as the alkaline portion of a soap is in the neighborhood of only 10 per cent of the total, it is readily seen from a theoretical standpoint, that the effect of the combined alkali is less than the effect of the combined acids.

Unfortunately we cannot obtain a fat of 100 per cent of any particular fatty acid. We are restricted, and as a result, we do the best we can; we obtain fats and combine them to give the properties so that they will do the work we wish them to do.

As far as alkali is concerned, we are limited to two kinds; potash and soda. There has been a great deal of discussion as to which is the better. It is a question that

should not be decided arbitrarily. We have made a study of this question and have obtained some interesting results. The greatest differences in the soaps of the different alkalis are in appearance and odor. The soda soap is the hardest, the potash is next hardest, and the ammonia soap is the softest. The ammonia soap has an odor of ammonia, the others have a pure soap smell. Inasmuch as the ammonia soaps are not practical we will not consider them further.

As far as effects on the fibers are concerned, the soaps of the different alkalis are very similar. However, the soda soaps are a trifle milder; they have a less harshening effect on the fiber. This is indicated primarily by the fact that under any given condition, textile fibers absorb more potash than soda. In the first place the potash soap in solution liberates more alkali. For instance, in a 0.3 per cent solution at 90°C. pure potassium palmitate liberates 6.8 per cent of the total alkali available, whereas the sodium soap liberates only 6.6 per cent of the total alkali. This means, that from the potassium soap there is 0.2 per cent more alkali available to be absorbed by the fiber. In the second place the fiber absorbs more of the combined potash than it does of the combined soda. Thus from the above two solutions at 50°C. equal weights of wool absorb 14 per cent of the total alkali present in the potash soap solution as compared to 12.7 per cent of the total alkali in the soda soap. In the third place, the soda soap rinses better, thus leaving less alkali in the fiber. Thus wool which has been soaked at 50°C. in 0.3 per cent potassium palmitate and then rinsed for 10 minutes, retains 32 per cent of the soap. Under similar conditions with soda soap 29 per cent is retained. Here we have three very clear evidences of the amount of alkali the fiber absorbs. If we can demonstrate by three methods such as these that the soda soap leaves less alkali on the fiber, I think we have an excellent indication that the soda soap actually has less effect on the fiber. For have we not proved that it liberates less alkali, that the alkali liberated is absorbed less, and that the absorbed alkali rinses better?

Let us take it from a practical standpoint. For instance, a great deal has been said concerning the harshening of wool, by soda soap. You have probably heard of it. Such a statement is based on myth not fact. We have not, in even one instance in contacting many mills, found a case wherein the potash leaves the fiber softer.

The other portion of the soap, which represents 90 per cent, is the acid portion, or the fatty acid portion. This portion of the soap has the greatest effect on its properties. Thus we find that there is a decided difference between the sodium stearate and sodium oleate. In discussing soaps of different fatty acids, it is best to discuss them from the two extremes, stearic acid or oleic acid. When I say stearic acid, I include palmitic acid because it is so similar. The stearate shows poor solubility, poor rinsibility and a high degree of hydrolysis as compared to the oleate. It shows its greatest efficiency as a detergent at temperatures near to the boil, and much reduced efficiencies at lower temperatures. The oleate, on the other hand, shows only slightly reduced efficiencies at lower temperatures. Commercial soaps have properties which bear a direct relation to the relative quantities of oleate, stearate and palmitate present, and thus to the titer of the soap. The nearest approach to straight oleic acid in soaps from the natural fats is olive soap, which shows 80 per cent oleic and 20 per cent stearic acid, and a titer of 21°C. The titer represents the melting point of the fatty acids. Tallow soaps and palm soaps with titers of 42°C., on the other hand, show properties more similar to sodium stearate and palmitate since they contain 50 per cent of these materials. As a result, soaps such as olive are excellent detergents around 110°F. whereas the tallow and palm soaps are less efficient at these temperatures. Also the olive soap rinses best and the tallow the poorest.

When you select a soap for any particular work in a mill, first of all you should determine what are the conditions under which the soap is to be used. If the soap is to be used as a scouring agent at temperatures under 130°F. a low titer soap, high in oleate and low in stearate, should be used. If it is to be used at 160°F. or above, and you are not desirous of removing all of the soap, you should use one containing the greatest portion of stearic acid. Another thing, in finishing cottons and rayon, frequently you wish to put more body into your finished piece—in that case, the tallow soap is superior to the olive soap. The stearic acid soap in the tallow soap does not rinse as well as the oleic acid soap, therefore, you have more soap left on the fibers under ordinary conditions. However, the soap film left will not be as soft as obtained with the lower titer soap.

One interesting thing in regard to soaps and their application in the textile mill, and one which is to me probably the most interesting in the woolen industry, is the use of the soap in the fulling mill. Here for years many people have claimed it is necessary to use such a soap as palm or tallow. Theoretically and practically, that is incorrect. We have found that the ideal soap for fulling is one which will lubricate the fiber. You will find the most liquid soaps, such as oleate soaps, do this best. They give more penetration of the soap, and therefore a cleaner fabric from which the soap rinses better. Tallow and palm soaps can be used, especially on heavy fabrics such as overcoatings, the reason being not that they are superior, but that they are cheaper. For here, although penetration is not uniform at the start, it becomes so by the time the fulling is finished. But even so there is always the danger of smelly goods due to the poor rinsing qualities of the high titer soaps.

In discussing any textile soap, I think we should not omit textile soap substitutes. They have been a valuable aid to the industry and many of them are worthwhile. However, scouring compounds, fulling oils, degumming oils, etc., are innumerable. Almost all of these owe their use to the hope that they are cure-alls for trouble. Actually, the good ones are 20 per cent to 40 per cent soap solutions, of low titer soaps. A low titer soap of olive type will do as good work and at a greatly reduced cost.

In considering soaps, I think we should consider what the soap manufacturer is trying to do. He has made some mistakes, but fortunately, I think those mistakes are becoming fewer. He has attempted to manufacture and standardize the products he is offering to the trade. Today those products are available absolutely uniform. I am talking about progressive manufacturers who are looking ahead and are hoping to serve you.

In the soap trade there have been some interesting developments in the past few years. For instance, we have made and are producing regularly a soap in flake form approaching true sodium oleate. This is certainly an improvement over soaps previously available. Also a soap has been produced during the past year which reduces the silk degumming cost by 25 per cent. This particular soap is finding standard application.

Of general interest, it is worth mentioning that there are available to the soap manufacturer something over a hundred fats that vary in stearic acid, oleic acid, and palmitic acid content. These fats have various titers. Palm oil, for instance, has a titer in the neighborhood of 44° C. and contains in the neighborhood of 50 per cent palmitic acid. Cotton seed oil has a titer in the neighborhood of 35° C. and contains approximately 40 per cent stearic acid. Tallow has a titer of 42° C. and contains approximately 50 per cent stearic acid. Olive oil has a titer of approximately 21° C. and contains approximately 20 per cent stearic acid. If a textile mill finds it needs a soap of 30 per cent stearic acid, that soap can be obtained by blending any of these various fats together to obtain the desired product. Howver, it is not quite so simple as that for the reason that other things develop. In the case of cotton seed oil, it shows the desirable stearic acid content for certain work, but it is dangerous on account of rancidity which is a problem confronting the textile manufacturer at all times. For this reason of rancidity, cotton seed soaps are almost automatically eliminated.

I have attempted to be more or less general because I don't know just exactly what you are looking for in a talk about textile soaps. If you have any definite questions or ideas in your mind on any particular phase of your work, as to what the soap manufacturer has to offer, or might have to offer, or what you might expect of the soaps offered, I will be glad to answer those questions or go into further detail. I have tried to tell you what might be available and would be glad to explain anything I can in regard to any soap which you might have. I would appreciate it if you would make it an informal discussion for really I did not come to lecture. Thank you.

Question: I have heard rumors that there was a soap coming on the market called a "regenerative" soap. Could you tell us what it is?

Answer: That is a soap primarily for the silk industry. It is the soap I just mentioned as decreasing the amount of soap necessary to degum silk. Briefly, with silk you have a material (sericin) which can be removed best at a high pH or a low pH. Unfortunately, the silk is attacked at the high and low pH's and hence we are restricted to pH's somewhere between the limits of 10.2 to 4.6. The greatest efficiency of soap in removing gum is at a pH of about 10.2 (making diagram on board). The effect on the fiber is greatest with pH's above 10.2, so we are limited to the range given above (illustrating). The least efficiency is at the center of this range or at a pH of 6.5 approximately. The ideal soap for silk degumming would be here (illustrating at 10.2). That is where all soaps are, out towards the 10.2 range. As you remove the gum from the silk fiber, the gum attacks the soap and the pH falls off until it gets here—(around 7 pH). As a result, the soap is not nearly as efficient after an hour's use as at the start. The ideal thing would be to have a soap maintaining a pH here (illustrating at 10.2 pH). The soap we have developed does this. I am not free to tell you how, but it does. It maintains a pH near to the pH of pure soap at all times and never goes above it. It is impossible to maintain the pH exactly.

Question: I suppose eventually we shall be told how it is done?

Answer: I cannot answer that nor can I tell you if anyone else is working on it.

Question: I was wondering which is the better soap in the kier, high titer or low titer?

Answer: That is a question I wish that I could answer exactly, but I don't believe I can because in the kier you have more than one consideration. Offhand one might be inclined to say that tallow soap is the better because in the kier you are operating at a high temperature. On the other hand, I am inclined to say it is not the right answer. Many people are using the low titer soaps and find that they are better. Probably some of you men might have some ideas as to it.

(Reply from floor): I think I can give one reason for that, which came under my own personal observation in a case of making a substitute for a certain detergent for a kier. That detergent was composed of red oil. We found out early in the game that if you used tallow com-

pounds in there, in both cases you get the same amount of lime soap from lime in the water; but the reason they make this particular red oil, was due to the fact that although the lime soaps are there in both cases the oleate soaps are softer and in the bottom of the kier you don't see them, whereas when you have the high titer soaps you find pieces of lime soap scattered all over the goods.

Question: Do you happen to remember roughly the iodine number of cotton seed? Is it fairly high?

Answer: It runs in the neighborhood of 110 or 120. This high iodine value indicates susceptibility to oxidation and hence rancidity. It is for this latter reason that cotton seed oil is a poor fat for a textile soap.

Question: I notice that a good many fats are available which we don't ordinarily use, such as Chinese tallow. I have always wondered how much actually got into the soap trade. They are on the market and you can get them at times.

Answer: As far as I know, I don't think any of them get into soap for the textile trade. There are times when the prices are right and they may be used as household soaps. The textile trade demands uniformity. For that reason I don't think any sane soap manufacturer would take a chance.

Question: I was interested in your statement about the number of soaps needed for a textile manufacturer. A man who has had wide experience in finishing goods told me that as far as sulphonated compounds are concerned, if a man had a good sulphonated castor and olive oil, he ought to be able to do ordinary finishing with it. On the other hand, a concern in New York, one concern alone, was found to have thirteen varieties of oil for finishing rayon.

Answer: If you look them over, you will note that there is not much difference in the nature of the constituents.

Question: If you have dirty cloth and lime soaps collect, will castor oil soap have more of a detergent action than any other soap at low temperature?

Answer: Any difference will be very slight and probably not noticeable. Certainly it would not offset the greater cost of castor oil soap.

Question: Will the red oil soap work better than the castor at low temperature?

Answer: They are very nearly equal in performance.

Question: In the kier, rosin used to be used with potash and the white that you obtained was better. The cloth was more thoroughly cleansed.

Answer: Both theoretically and practically this should not be true. Rosin soap is relatively poor in detergent action and likely to cause discoloration in hard water.

Question: At one time I was making red oil soap and putting in rosin. The bleacher told me the soap was never as good after that. Whether he was right or wrong, I don't know.

Answer: It has been our experience that rosin soap is not as effective as some other soaps.

Question: What is your idea of solvent in combination with soaps?

Answer: Solvents with soap have application in certain instances. As a universal aid I think their value is exaggerated. There are certain types of materials which solvents aid. For instance, hard water soaps are better suspended in the presence of certain solvents. You can demonstrate that on a small scale. From a practical standpoint, I don't know whether it means anything. By the time you have put in the solvent, the cost is such you could overcome the difficulty in other ways. Materials other than lime soap which get on your cloth are sometimes best removed with the aid of solvents. However, most times these materials can be removed better by a proper scouring procedure with soap and alkali. Quite frequently it means the use of more alkali.

Question: Does the type of soap differ any, if using immersion or foam types of degumming.

Answer: No. The most desirable soap for silk degumming, outside of the new development, is the nearest approach to sodium oleate that you can obtain. An oleic acid soap is the best for either process, whether foam or immersion. The main question in silk degumming is, "are you going to get the soap out of your silk afterwards?" For all weighted goods this question eliminates tallow soaps because they rinse with difficulty.

Question: Will a soap stand up better by one method than another?

Answer: I believe foam degumming requires somewhat less soap than the immersion process because a higher temperature can be maintained.

Question: Does a caustic bath decrease the time of degumming?

Answer: Yes, a caustic bath decreases the time of degumming. The use of caustic on silk, however, is a very dangerous procedure. You can soak silk in a mild caustic bath and take off some of the gum. You can do that and then finish off in soap. This is possible but rather dangerous.

Question: Can you tell me why by taking soap—olive oil—boiling up and making solution, let stand four or five hours, and you can't get the same lather—after it has stood?

Answer: A solution of good soap should show little, if any difference, except under most unusual circumstances. Carbon dioxide from the air effects soap to some extent, particularly if not well made, so as to reduce its sudsing power. Ordinarily with a high grade soap, this effect should not be large.

SIXTY-THIRD MEETING OF THE RESEARCH COMMITTEE

THE Sixty-Third Meeting of the Research Committee of the American Association of Textile Chemists and Colorists was held at the Engineers' Club, Boston, Mass., Friday, January 16, 1931, at 2:45 P. M.

The following were present:

Prof. L. A. Olney, Chairman
Wm. D. Appel
Wm. H. Cady
Hugh Christison
Dr. Carl Z. Draves
Walter C. Durfee
Harry R. Davies
Henry D. Grimes
Walter E. Hadley
B. L. Hathorne
Arthur E. Hirst
Harold W. Leitch
Claxton Monro
Carl Moore
Wm. R. Moorhouse
George A. Moran
Dr. D. H. Powers
Dr. Walter M. Scott
P. J. Wood

Alex. Morrison, Secretary

Regrets at inability to attend the meeting were received from Messrs. Killheffer, Culver, Herrmann, Lotte, Chase, Myers, Barnes.

The Chairman outlined in detail the program of the Research Committee, calling attention to several problems now underway that will be finished this year. He also mentioned new fields that might be taken up for the consideration of the Committee. Among these was the rating of dyestuffs in accordance with their ability to stand up under our various fastness tests. Another subject was the study of the process of carbonizing and its many intricacies.

He also outlined the possibility of investigating and perfecting standard procedures in more or less everyday use in the textile field. This is now being done by our Sub-Committees on Standard Methods of Determining Sizing and Finishing Materials in Textile Fabrics. Other subjects of this order to be given consideration are standard methods of Fabric Analysis, of Shrinkage, of Determination of Waterproofing Materials, and of Dye Evaluation.

In connection with this whole matter a letter from H. M. Chase was read in which several very valuable suggestions were made of subjects which might be considered by the Research Committee.

Wm. D. Appel led a general discussion on subjects for investigation, stressing the point that rather than simply set up standard methods for this or that, we ought to do more research on what actually takes place when a fabric shrinks, or when sizing compounds are applied, or when goods are carbonized, etc., etc.

The Chairman read the report of our Research Associate at the Bureau of Standards showing progress along several lines.

Wm. H. Cady, as Chairman of the Light Fastness Sub-Committee, outlined the work this Committee has in hand. He mentioned work to be done in connection with testing Dr. Paul Krais' Test Paper for fixing sun hours when making light fastness tests.

Hugh Christison, Chairman of the Sub-Committee on Fastness Tests for Dyed Wools, reported that his Committee were about to prepare cloth dyed with their standard shades for washing fastness.

Hugh Christison, Chairman of the Sub-Committee on Fastness to Perspiration, asked Dr. Carl Z. Draves, who had done a considerable amount of work on the study of the pH tests solutions used in making these perspiration tests, and on possible substitute solutions, to tell the Committee of his work. Dr. Draves read and discussed a lengthy paper on these pH determinations and exhibited many tests on different fabrics dyed with different dyes tested with different solutions. This paper Dr. Draves expects to publish shortly and it will undoubtedly appear in the DYESTUFF REPORTER in due course.

Dr. Walter M. Scott, Chairman of the Sub-Committee on Fastness of Dyed Silk, discussed and defended the dyed silk standards for washing fastness adopted by his Committee, and expressed the hope that those in the trade interested in the matter would procure some of these swatches now on sale and make suggestions. In the meantime the Committee will continue its work to see if any changes or new standards should be adopted.

The Chairman announced two new Sub-Committees. One on Materials for Construction of Dyeing and Finishing Machinery, with Harold W. Leitch as Chairman; and the other on Wetting Out Agents, with Dr. Carl Z. Draves as Chairman.

In view of the fact that our Association is to receive $5,000 from the Textile Foundation for Textile Research, and as our program had been outlined it was the consensus of opinion that we should engage more paid Research men to carry on the work to completion and show accomplishments. The matter was very thoroughly discussed and it was voted that—

The Research Committee appoint a Committee to employ a man for fundamental research for our Association.

This man, it is planned, will be stationed as a Research Associate with the Bureau of Standard as headquarters, as is our present Research Associate, Wm. C. Smith.

The Committee appointed were Chairman L. A. Olney, P. J. Wood, Wm. D. Appel, Dr. Walter M. Scott, and Dr. D. H. Powers.

It was also voted that the Research Committee employ a man as research assistant at Lowell Textile Institute to work with the various Sub-Committee Chairmen.

This man will take the place of the part-time man at the Lowell Textile Institute whom the Chairman was authorized to engage some time ago but who has not been engaged.

The Chairman was appointed the Committee to engage this man.

The meeting adjourned at 5:30 P. M. to meet in New York, February 27, 1931.

Respectfully submitted,

ALEX. MORRISON,
Secretary.

JANUARY MEETING OF THE NORTHERN NEW ENGLAND SECTION

THE Northern New England Section met at Riverbank Court Hotel in Cambridge on January tenth. Forty-one were present at dinner, and fifty at the meeting.

Harry R. Davies spoke on the Chattanooga meeting, and William H. Cady on "Peculiarities in Fading."

At the next meeting, on Saturday, February seventh, Eskel Nordell of the Permutit Company's Technical Department will speak on "Treatment of Water for the Textile Plant."

Respectfully submitted,

HAROLD C. CHAPIN,
Secretary.

APPLICANTS FOR MEMBERSHIP

Active Membership

Lilly, J. M., piece dye overseer, Dan River Mills, Schoolfield, Virginia. Sponsors: W. M. Hunt and H. M. Chase.

Linder Robert W., textile chemist, Waldrich Bleachery, Delawanna, N. J. Sponsors: Oscar R. Flynn and Duncan Ferguson.

McLeod, Edward H., colorist, Waldrich Bleachery, Delawanna, N. J. Sponsors: Oscar R. Flynn and Duncan Ferguson.

McAteer, J. R., full fashioned dyer and finisher, Hatch F. F. Hosiery Co., Belmont, N. C. Sponsors: Charles H. Stone and A. R. Thompson.

Rooney, Henry T., chemist, Pacific Mills, Worsted Division, Lawrence, Mass. Sponsors: John N. Dalton and Harold W. Leitch.

Turner, W. H., dyer, Regent Knitting Mills, Ltd., St. Jerome, Que. Sponsors: William R. Moorhouse and Arne K. Gyzander.

Walker, H. A., hosiery dyer, Morganton F. F. Hos. Co., Morganton N. C. Sponsors: Charles H. Stone and W. M. Hunt.

Junior Membership

Caswell, Ernest L., chemist, Franklin Process Co., 564 Eddy St., Providence, R. I. Sponsors: Hector G. Macdonald and A. Newton Graves.

Smith, Peter C., laboratory assistant, Apponaug Co., Apponaug, R. I. Sponsors: Henri N. F. Schaeffer and Alex. Morrison.

AMERICAN DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
Professor of Chemistry and Dyeing, Lowell Textile Institute
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BLISS MORRIS JONES
Managing Editor

MYRON DREW REESER
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Vol. XX February 16, 1931 No. 3

COLORS TO INCREASE EFFICIENCY

REALIZATION that the machine-age man, for all his appearance and monotonous routine, is stimulated by the pleasantries of harmonious light and color has put engineers to work creating a new environment for him.

This new development is taking the form of schemes of color and lighting for interiors of factories and offices. Colors which have formerly only beautified the homes are now being investigated for their possible use in industrial plants.

Color scheme charts are being worked out by Matthew Luckiesh, director of lighting research at Nela Park. His theory is that a majority of workers are happier, more enthusiastic and consequently more efficient when they work in an environment that has color appeal. He is working out schemes of cool colors for factory interiors where hard, muscular work is done. Offices, he says, should have warmer colors. Where women work on some delicate feminine material, some such color as orchid should predominate.

Practical application of these ideals is being carried out by the Austin Company of Cleveland, engineers constructing the new windowless plant of the Simonds Steel Industries at Fitchburg, Mass. Imitating the effect of forest and sky, the walls and ceiling of the factory interior will be blue, green and white, while the machines will be colored orange. The orange color is to raise the visibility of the machine parts, thus promoting safety.

Besides providing illumination in the windowless plant where the variations of sunlight will not be permitted to interfere with the two shifts of eight hours each, the lights will produce a portion of the heat. Ventilation, forced from overhead, is designed to give theoretically perfect results at all times.

Machine noises, which have grated on the human ears since the beginning of the industrial era, will be silenced to a large degree by sound absorbing material on the walls and ceiling. The machines will be laid on heavy felt pads, and silencers are to be placed around gears whenever it is possible. Wilbert J. Austin, president of the constructors, says that the plant will be so quiet that the factory office will be in the same room with the machines and workers with no partition in between. He expects the new environment in the factory to increase efficiency 33 per cent.

LUXURIES OR TEXTILES?

IT HAS been years since profits were possible under wasteful methods.

Why are progressive methods adopted, and why do some plants maintain a research department to study changing conditions and develop means by which they can keep up with the evolution? Is it not because they realize that nothing stands still and they must either keep progressing or drop out?

To anyone, a future devoid of profit is a dismal outlook. Further expenditures without definite assurance of improved conditions is speculation on the long side. Apathy and gloom are speculation on the other side, therefore, we speculate whether we do or whether we do not.

It is just as well to lose our all in our own business as to lose part of it in business guided by others' judgment, especially if our investments help to finance things that tend to demoralize our own business.

In a showdown, food and clothing would survive amusements and luxuries, therefore, manufacturers of textile materials are assured a market commensurate with the attractiveness their goods have for the consumer.

Luxuries are produced in many grades, and they all strive for the de luxe models. Perhaps this is an indication for the textile industry. More effort might be made to regain the pride in personal adornment that has been alienated to a large extent.

If luxuries appeal to the vanities, and amusements attract because they please and thrill, textiles should be so designed and redesigned that their possession would afford more pleasure and some thrills. A far greater share of peoples' cravings should be for textiles.

NATIONAL CREDIT SURVEY

FOLLOWING the announcement from Washington that the Department of Commerce, in co-operation with the National Association of Credit Men, is shortly to begin a nation-wide survey of wholesale credit methods, practices and policies, Dr. Stephen I. Miller, executive manager of the association, has called upon credit executives throughout the country to supply all information that may be requested of them in the course of the survey.

In a letter to 145 local credit associations affiliated with the national body, Dr. Miller said that the survey should be of direct benefit to wholesalers, manufacturers and commission houses, since it will furnish them with a vast fund of information, never before available, bearing on credit relations with retailers.

"The survey will throw a revealing light on such problems as the degree of lag in past due accounts, the extent of bad debt losses, the taking of unearned discounts and the attempts of buyers to dictate terms of sale," he said.

"Questionnaires to be used in the survey have been worked out with the greatest care by representatives of the Department of Commerce and the National Association of Credit Men. They are designed to elicit information of practical value.

"Firms contributing information will be classified according to lines of business. When all the information has been tabulated, we will know the average bad debt loss in each principal division of business, the normal lag of past due accounts, and the extent to which terms grabbing and other credit evils exist in various lines of trade.

"Each industry will have its particular credit problems brought out into the open. The individual credit manager will be provided with a yardstick which will enable him to measure the effectiveness of his credit methods against the average for his industry.

"Since intelligent credit management is vital to sound merchandising, it is particularly fortunate that we are to have this basic inventory of our mercantile credit structure at this time. The information gathered should give every credit manager a better approach to his daily problems."

Look Ahead!

FROM every depression come new names, new faces, new fortunes, new business leaders. There are always a few who do not wait for Opportunity to repeat her knock at the door—and show credentials. There are always a few—even as there are a few today—who with foresight and common sense go quietly into a low-priced market, stock up raw materials, lay up supplies of every kind—even to household and personal supplies—and get ready for the inevitable upturn.

If you look about you, you will note that most of the big fortunes of today, and the successful men, came up out of times like these. Not blind buying, but intelligent buying, based on a complete picture of one's business in full view. Not a worm's-eye view alone, but the view of a man who on a clear day sees ten years ahead.

Never fear, from this tragedy of plenty there will come new names for the business headlines of tomorrow. They are in the making now.—Merle Thorpe in *Nation's Business.*

Variable Expressions of Color in Trade Making

By WALDON FAWCETT

AS realization spreads, in the spheres of commerce and industry, that mass color is not allowable as a medium of trade marking, interest grows in the expressions of color which are allowable under the registration rules of the U. S. Department of Commerce. From the basic subject of the service of color-carriers in merchandise branding, curiosity is now extending to a branch of the subject which has only lately claimed attention, viz., that of the variations in color expression necessary to produce individuality in vehicles of commodity identification.

A moment's reflection must convince any participant in color supply of the importance of this issue in the face of the strong trend to trade marking in all lines—including raw materials as well as manufactured products. The infinite variety which has been achieved in recent years by the color and dyestuffs industries is of little avail to the great majority of trade markers in color. Considerations of reproduction in advertising, and other complications, deny to all but the most adventurous trade markers, the unusual tints and shades which strike the new notes in the color cards of industry. Because of the various conservative factors—not forgetting the circumstance that a trade mark in color is adopted, presumably, for a long period of use—the majority of trade markers have no choice but to adhere rather closely to the colors of the spectrum.

Given this enforced confinement to a relatively narrow range of sharply defined major colors it becomes apparent how much depends upon the ethics of color translation into trade mark forms. With thousands of trade markers converging upon the few primary colors the whole question of the future employment of color in trade marking hinges upon the official Federal determination of what constitute adequate differences as between two or more translations or expressions of the same color, employed for authenticating the origin or ownership of goods. Oddly enough, there have been, to date, surprisingly few pronouncements from the tribunals at Washington on this specific angle of the subject. Test cases are appearing, however, as the quest for distinctive trade marks leads away from the well-nigh exhausted field of arbitrary symbology in color to the even more difficult art of implanting a meaning, via color, in structural elements or inherent features of articles of commerce.

The most notable test case, and the most recent one, to focus sharply on the allowable range of color diversifi-

cations has occurred in connection with the trade marking of coal. Here is not only an issue but an environment calculated to stir the imagination of members of the color supply industries. No incident is better calculated to illustrate the spread of trade marking, and particularly color-marking, into unconventional fields. A few years ago the suggestion that coal or any other similar bulk material could be effectively trade marked would have been met by utmost skepticism. Today it is an accomplished fact and, furthermore, we find an almost universal dependence upon color for branding the erstwhile hard-to-brand commodities. So much so, that competitive branders are seen challenging one another in the courts in matters of color jurisdiction.

The particular episode which gives text for this appraisal grew from a conflict of color interest between the Delaware, Lackawanna and Western Coal Company and the Blackwood Coal & Coke Company, both claimants of expressions of the color blue as clue to the identity of their respective fuels. The Delaware & Lackawanna Company was first in the field with its version of "blue coal" and, in due course, secured registration at the U. S. Patent Office for a mark contrived by coloring blue the lumps of coal in the mass. Having thus preempted, as was believed, the trade mark technique for an all-over blue veneer, the pioneer made formal protest at the Division of Trade Marks when the Blackwood Company made application for the registration of a trade mark design consisting of a plurality of blue specks of irregular size on the surface of the lumps.

In support of its claim to broad rights in a blue overlay as a trade mark for coal, the Delaware & Lackawanna Company showed that for two years prior to the venture of its competitor, the first-mentioned concern had been applying to its coal the irregularly-shaped patches obtained by spraying a water solution of a blue color on the coal as it was loaded into cars. In consequence, the brander's product had come to be extensively known in the trade as "blue coal." While the matter of priority of use was not open to controversy the status of color was debatable and was made the crux of legal and technical argument, first before the umpire known as the U. S. Examiner of Trade Mark Interferences and eventually by way of appeal to the Commissioner of Patents.

To begin with, the Blackwood Company challenged the assumption that the senior brander in blue had a bona-fide right in a trade mark. The D. & L. mark was alleged to be nothing more or less than an indiscriminate application of the color blue to lumps of coal, the color settling in the crevices of the lumps and forming as many different blue marks as there are lumps of coal, no two lumps having crevices identically placed. The premise advanced was that such an "indiscriminate application of color" is not proper trade mark subject matter and is not entitled to disqualify another mark consisting of a plurality of blue dots or specks applied to lumps of coal and forming a polka-dot or freckle design thereon.

Although the junior party had pointed out, during the trial of the case, that its trade mark is expressed in a much lighter shade of blue than is employed by the senior party, the Examiner of Interferences ruled that "Viewed at a comparatively short distance it is doubtful if a person could well distinguish between the two marks." He concluded that the marking employed by the one firm so nearly resembled the marking employed by the other house that confusion would be likely. The Blackwood Company, thus defeated in its attempt to register, and feeling that the decision of the Examiner was nothing short of an award of the color blue which would deny to all other coal merchants "the right to apply this color to coal in any shape or form," proceeded to appeal to the authority higher up.

Nothing was gained by the recourse, albeit every effort was made to present the official policy in this matter as a frank transgression of the long-standing principle that recognition should never be given to any trade mark residing solely in color. The Commissioner of Patents in his turn held that the goods of the respective parties when viewed at such a distance that the general color effect of the entire mass would be observed would appear to the average purchaser as quite similarly marked and confusion would be practically certain to result if the two marks appeared in the same market.

In reviewing the case, the head of the Patent Office brushed aside the presumption that this case runs afoul the tradition that there can be no trade mark rights in mere color, or in color alone. As the Commissioner analyzed the instance there was presented the spectacle of a trader using from a prior date a mark consisting of a variegated irregularly spotted blue color effect and a later comer adopting substantially the same color and applying it in the form of irregular specks so as to produce upon the coal when viewed in mass much the same general effect as is produced by the other irregular coloring. The Commissioner concluded that there was almost as much variation in the rendering of the later mark as in the rendering of the older mark. Accordingly registration was denied to the second translation of blue.

By and large, the moral of the object lesson in color determination at the Federal clearing house for trade marks seems to be that later adopters of an occupied color must be prepared to depart sharply from the mode of expression employed by those already on the scene. The tenet holds good that no capitalizer of color for trade mark purposes may establish a monopoly in a single color apart from any figure, device or other exponent or expression such as sets boundaries upon color translation. But, on the other hand, if a chosen color is executed in a particular design or symbol, such as a circle, band, square, triangle, cross or stars, etc., the expression must be sufficiently different from other renditions in the same color to allow of no misidentification or mistakes by casual observers. In short color may be a background, an agent of emphasis, or a vivifying influence in trade marking but must be complementary to a distinctive name, form or device.

The Chemical Analysis of Sized Cloth

By G. SMITH, M.Sc., A.I.C.

THE chemical analysis of sized cotton goods is a matter of importance in the trade in a variety of different ways. In the simplest case the determination of the amount of size on a sample, by chemical stripping, is the only rational means of arriving at the true counts of the twist. A more detailed analysis, involving estimations of the amounts of all the constituents of the size, may often be of use in attempting to match a cloth whose characteristics of feel and appearance are unfamiliar. In investigating the causes of faults, also, chemical means must frequently be resorted to. In cases of mildew damage, for example, estimation of the amount of antiseptic present will determine whether a mistake has been made in mixing the size or whether the cloth has been exposed to abnormal conditions. Damage in calendering may be due to the presence of an excessive quantity of deliquescent substances, tendering of cloth when singed prior to bleaching may be caused by the use of metallic chlorides in the size, "dusting-off" may be the result of an error in weighing out the adhesives, starch or flour, in the tape-room, and in such cases chemical examination provides the only clue. The chief essential, if analysis is to be of real use, is that the results shall be accurate and trustworthy, and it is the purpose of this article to examine the available methods and to indicate how far they are capable of giving reliable results.

Many of the published methods are unsuitable, and are incapable of giving accurate results, even in the hands of a reliable and experienced analyst. Unfortunately, many gross inaccuracies may go undetected owing to the fact that the desideratum of all analysts, a column of results which add up to 100.00%, is invariably obtained. If all the figures usually returned as the experimentally determined composition of a sized cloth were actually obtained by experiment, a sum total of exactly 100% would have to be regarded as unusual and entirely fortuitous, since very few technical methods of analysis are capable of giving results of this degree of accuracy. As it is, there is at present no method available for the direct estimation of one very important constituent of the size—that is, starchy material—with the result that the round total is always obtained by returning the figure for starch and other adhesives as "estimated by difference"; in other words, by crediting the starch with all the accumulated errors of the other estimations. The significance of this ought to be more appreciated than it is at present, particularly in those cases where it is the custom (incidentally a bad one) of judging the probable resistance of a cloth to mildew infection by the ratio of the percentages of zinc chloride and starch. Until such time, therefore, as we have a reliable method for the direct determination of this important constituent, it is necessary that all the other figures be quite above reproach, or that the figure for starch be accepted with reserve.

An important fact is that in all but a very few cloths the constituent present in greatest proportion is cotton. If the latter were a single chemical individual it would cause little or no difficulty. Grey cotton, however, contains less than 90% of cellulose, the rest being made up of water, wax and resin, nitrogenous matter, a number of mineral salts, and small quantities of a group of constituents whose nature is still incompletely understood. If these minor constituents were always present in the same proportions, suitable allowances could be made when estimating similar substances present as ingredients of the size, but it is unusual for two samples of cotton to contain exactly equal amounts of any one constituent. However, during the last few years much has been elucidated concerning the chemical compositions of various cottons, and, in carrying out estimations of a few sizing ingredients, it is possible to make average allowances, for similar substances contained in the yarns, which will be, in nearly all cases, sufficiently near the truth for practical purposes. Such allowances are, at the best, but a makeshift, and it is only possible at present to carry out a complete size analysis with fair accuracy if there are at hand unsized samples of the actual yarns used in its manufacture.

Estimation of Moisture

The estimation of moisture is a necessary part of a complete size analysis, since, if it were omitted, it would be necessary to use bone-dry samples of the cloth for all the other determinations. Incidentally, it is advisable, when weighing a sample for moisture estimation, to weigh out, at the same time, a number of portions of the cloth sufficient for estimations of all the different size ingredients, in order to avoid errors due to variations in moisture content during the course of the analysis. An exact determination of the amount of moisture is a matter of some difficulty, for cotton loses the last traces of moisture at a temperature little short of that at which charring commences. A further complication is introduced by the fact that the latter temperature is lowered by the presence

*From Textile Manufacturer.

of metallic chlorides, and some heavily sized cloths will undergo visible decomposition at temperatures which are too low to effect more than a very incomplete removal of moisture. Fortunately, a very accurate figure is not essential, and results sufficiently near the truth for practical purposes are readily obtained, provided that a suitable drying temperature is employed. Some of the text-books recommend that the drying be conducted in a water-oven, often erroneously believed to give a drying temperature of 100° C. The temperature actually attained with this type of oven usually falls considerably short of 100° C., and the main advantage attending its use is that no special apparatus is required for regulation of temperature. The Shirley Institute recommends and uses a constant temperature oven at 110° C. Apart from the increased accuracy so obtained, an advantage of the higher over the lower temperature is that drying is more rapid.

A somewhat misleading practice of some analysts is to give the results of an analysis with the total water apportioned between cotton and size, the cotton being given 8% of its weight usually, and the size the remainder. It is not possible to state exactly how the moisture in a sized cloth is distributed amongst the various constituents, but it is well known that 8% is merely an average figure for the moisture content of cotton, and that the actual amount present in any particular cloth is a variable quantity, depending on the prevailing humidity of the surrounding air. A cloth containing 25% of size (about 60% on the warp) may have a total moisture content of 10%. In such case it is manifestly absurd to assume that the cotton retains its normal 8%, and that the size in intimate contact with the cotton contains 16% of water. It is far better, and more in line with what is customary in the analysis of other technical products, to state the results of a size analysis showing the amount of moisture in the whole cloth, and giving the percentages of the sizing ingredients calculated to a moisture-free basis.

Estimation of Total Size

The method advocated first by Thomson,* and familiarized by various other writers, is to strip the size from a weighed sample of cloth by boiling successively in 1% caustic soda, 1% hydrochloric acid and distilled water, each boil being of one hour duration and preceded by a thorough rinse under the tap, the pure cotton fiber being finally weighed in the bone-dry condition. Good results may be obtained by this method if care be taken to keep the cloth totally immersed in the boiling liquids, particularly during the acid boil, in order to prevent excessive tendering and possible loss of disintegrated cotton hairs. An alternative and safer method is to remove starch by means of malt extract instead of with boiling acid. The cloth is first rinsed in hot water, then steeped for 20-30 mins. in a fairly strong malt solution at a temperature of 60° C., washed thoroughly to remove as much as possible of the china-clay, boiled for one hour in 1% custic soda, rinsed, soaked for 15 mins. in hot, but not boiling, 1% hydrochloric acid washed till free from acid, and dried to constant weight at 110° C. Whichever method is employed it is necessary to correct the weight of pure cotton fiber for loss of non-cellulosic constituents. The correction recommended by Thomson, the addition of 1% to the weight of dry fiber, is most certainly too low. A large number of experiments carried out by the writer on yarns of various counts indicate that the average loss from the cotton itself during the stripping process is approximately 5%, fine yarns losing rather more, and coarse yarns rather less, than the average amount. If the estimation is undertaken merely to find the amount of size on the cloth, no further correction is usually required, but in a complete analysis the figure for total size must be as accurate as possible, and it is necessary to take into account the fact that cloths containing china-clay never lose the whole of this constituent in the stripping process. The stripped cloth should be ashed, the weight of ash converted to "dry china-clay" (see below), and this figure subtracted from the weight of dry cotton fiber before any other correction is made.

Estimation of Fat and Wax

The majority of the softeners used in sizing are readily soluble in a number of organic solvents which have little or no action on other common ingredients of size. The fat and/or wax in a sized cloth are, therefore, usually estimated by quantitative extraction in a Soxhlet apparatus, the extracted material being freed from solvent by distillation, dried and weighed. Thomson,* Bean,† and others have recommended ether as the solvent for extraction and, more rarely, petroleum spirit has also been suggested. Ether is, of all the common fat solvents, probably the least suitable for this purpose, as its action is far from being selective (it dissolves zinc chloride, for example), it is difficult to obtain free from water and alcohol, it is expensive, and its low boiling point results in a considerable loss during use. Fairly good results may be obtained with petroleum spirit, provided that it contains no hydrocarbons of high boiling point. The commercial spirit should be fractionated with a good column and only the portion distilling below 60° C. retained for use in the present connection. Whatever solvent be used, it is necessary to take into account the fact that cotton contains a small amount of wax, and that an allowance must be made for the amount of this extracted along with the softener it is desired to estimate. Clifford, Fargher, and Higginbotham‡ have carried out an exhaustive investigation of the extraction of cotton wax with various solvents and of the removal of fatty matter from grey cloth, and they point out that accurate estimation of the fatty ingredient of size necessitates the use of a solvent which will rapidly remove either the whole or a fairly definite percentage, of the natural wax of cotton. They show that what is commonly called cotton wax is really a mixture of fat, wax, and resin, and that part of this is readily

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* Thomson, "The Sizing of Cotton Goods," 2nd ed., p. 226. (Manchester, 1879.)

†Bean and Scarisbrick, "The Chemistry and Practice of Sizing," 10th ed., pp. 591-612. (Manchester, 1921.)

‡Clifford, Fargher, and Higginbotham, "J. Text. Inst.," 1924, 15 T 120.

extracted from cotton, but that the removal of the remainder is a more difficult matter, requiring the use of hot chloroform and a comparatively long period of extraction. The removal of fat and wax, but not resin, is effected most readily by means of carbon tetrachloride, and it is shown that three hours' such extraction, in an ordinary Soxhlet apparatus, will remove the whole of the fatty constituent of the size along with a fairly definite proportion of the cotton wax. Apart from its efficiency, carbon tetrachloride is preferable to petroleum spirit in that it has a constant boiling point, and the fact that it is not inflammable gives it an advantage over both ether and petroleum spirit. The extraction apparatus should be entirely of glass, with ground joints, since neither cork nor rubber is suitable for making connections which come into contact with solvent vapor. The carbon tetrachloride used should be the purest obtainable, and, if the same solvent is used repeatedly, it should be purified occasionally by distillation over paraffin wax. The average amount of cotton wax extracted lies between 0.4% and 0.5% of the cotton. In most cases of size analysis either figure is sufficiently accurate, but with certain cloths containing very small amounts of fat satisfactory figures are obtained only if the analyst has at hand, for comparative purposes, unsized samples of the actual yarns.

In a particular case a sized cloth containing glycerine and only a small amount of fat was submitted to two analysts, one of whom found that the sample contained no added fatty matter, whilst the other reported a small percentage of fat in the size, almost exactly the quantity which was actually present. The first analyst had assumed the presence of 0.5% and the second 0.4% of wax in the cotton, and, since neither of them had unsized yarns for blank tests, they were equally justified in their assumptions.

The identification of the particular fatty ingredients of the size is sometimes required, and this, which must be carried out by examination of the extracted mixture of fat and cotton wax, is often no easy matter, especially when a mixture of two or more softeners has been used. It has been considerably simplified, however, by the publication of a number of papers by the B.C.I.R.A. Fargher and Higginbotham§ give full details of methods for the determination of acid value, saponification number, unsaponifiable, iodine value, and acetyl value, using very small quantities of material, and Lecomber and Probert‖ show how these may be utilized for the characterization of the fatty substances in sized cloth, using as little as 20 grams of the sample.

Estimation of Glycerine

Smith¶ has described a reliable method for the qualitative detection of this substance, and a method of estimation which is satisfactory for fairly large amounts, but which breaks down when less than about 0.5% (on the total cloth) is present, owing to cotton containing a substance which closely resembles glycerol in chemical properties. The cloth is extracted with alcohol in a Soxhlet apparatus, and the solvent distilled off. Water is added and fat and wax removed by filtration. Zinc and magnesium are precipitated by the addition of sodium carbonate and caustic soda, and the neutralized filtrate is evaporated to small bulk. For the qualitative test the glycerol in this solution is oxidized with bromine, and the dihydroxyacetone produced is identified by the colors given with phenolic substances in presence of concentrated sulphuric acid, or, alternatively, the purified extract is benzoylated by the Schotten-Baumann method, and glycerol identified by the production of a crystalline benzoate, melting at 72° C. For estimation of the glycerol the purified extract is further evaporated nearly to dryness and the residue analyzed by the I.S.M. acetin process.

Neale** gives the method which is more elaborate but which is satisfactory even with very small quantities. The sample is extracted with acetone in a "hot Soxhlet" apparatus and the extract evaporated to dryness. The residue is extracted three times with a cold mixture of alcohol and ether, a little boric acid is added to prevent loss of glycerol, and the solution is taken to dryness on the water-bath, care being taken to remove the last traces of alcohol. The residue is washed into a separating funnel with 20 c.c. of dilute sulphuric acid, and traces of fat removed by shaking with 60 c.c. of light petroleum. The aqueous layer is heated to drive off any petroleum and filtered into a steam-jacketed gas burette over mercury. The glycerol is oxidized by heating to 100° C. with 2 c.c. of 40% sodium dichromate, and the volume of carbon dioxide evolved is measured with the usual precautions. The amount of glycerol is calculated from the volume of gas. The accuracy of the process depends on the care with which the purification of the extract is carried out.

Estimation of China-Clay

The importance of an exact determination of this substance lies chiefly in the fact that it is often present in much greater amount than any other constituent of the size—it may, in fact, comprise considerably over 50 per cent of the total size—and that any error in its estimation is reflected as a much greater proportionate error in the figure for starch. A method which has been often described in the literature on sizing consists in estimating the total ash and deducting from this amount the amounts of all other substances likely to remain after incineration. Apart from the fact that the exact composition of the ash from a sized cloth has never been determined, it is obviously unsatisfactory to estimate china-clay "by difference" and then use the figure so obtained for finding the amount of starch "by difference." A simple, direct method has been described by Smith,†† the accuracy of which is limited chiefly by the small natural variations in the amount of combined water in commercial clay. The method consists in heating a weighed portion of cloth

§Fargher and Higginbotham, "J. Text. Inst.," 1924, 15, T 75.
‖Lecomber and Probert, "J. Text. Inst.," 1925. 16, T 345.
¶Smith, "J. Text. Inst.," 1926, 17, T 187.
**Neale, "J. Text. Inst.," 1926, 17, T 511.
††Smith, "J. Text. Inst.," 1928, 19, T 323.

with "constant boiling" hydrochloric acid (sp. gr. 1.1) until the cotton is broken up to a pulp, filtering and igniting the residue, at a high temperature, to constant weight. The weight of the residue is divided by 0.87, and the figure thus obtained is reckoned as dry china-clay.

Estimation of Zinc and Magnesium

The accurate estimation of magnesium is complicated by the presence of an appreciable and variable amount of this metal in cotton itself. Zinc is also present in raw cotton, but not in sufficient amount to vitiate the results of a size analysis. A further complication is introduced by the fact that acid extracts of cotton cloths always contain a small amount of iron, which it is usual to remove before determining zinc and magnesium. Since the mineral matter of cotton contains quite a large proportion of phosphates, it is certain that in precipitating iron by means of ammonia a small quantity of magnesium and/or zinc will be precipitated and removed at the same time. Under these circumstances the accuracy of the estimations carried out by one of the available published methods is extremely doubtful, particularly when samples of the unsized yarns, for blank tests, are not available. Apart, however, from possible errors due to the presence of other sizing materials and of cotton, it is true, as an excellent and recently published text-book on inorganic analysis‡‡ has pointed out, that the estimations of zinc and magnesium are amongst the least satisfactory processes which an analyst has to perform, since the errors inherent in the available methods are comparatively large, especially when small quantities of the metals are being estimated.

In the method for zinc described by Bean,§§ Ermen,‖‖ and others, precipitation as sulphide and conversion of this to zinc oxide is very liable to give erratic results. The estimation of magnesium by precipitation of magnesium ammonium phosphate hexahydrate, the precipitate being weighed as such or converted to pyrophosphate, gives moderately good results, if care be taken to insure that the precipitate actually has the desired composition¶¶. In a method described by Neale** the cotton is extracted by boiling with dilute nitric acid, magnesium is precipitated as phosphate in alkaline solution and then zinc phosphate is precipitated by neutralizing the filtrate. Each precipitate is dissolved in acid and the phosphorus precipitated by means of ammonium molybdate, the phosphomolybdate being filtered off, washed, dissolved in standard sodium hydrate, and the solution back-titrated with standard acid. The method, although it is the most accurate available at the present time, is somewhat clumsy and requires very strict attention to details of precedure. There is certainly need for new, accurate, and simple methods for the estimation of both these metals.

Estimation of Chloride and Sulphate

The method described by Neale** for determining the total amount of chloride ion is undoubtedly the most satisfactory. The cloth is extracted by boiling with dilute nitric acid, the chloride is precipitated with excess of standard silver nitrate, and the filtered solution is back-titrated with ammonium thiocyanate. This is decidedly more accurate than attempting to apply Mohr's method of direct titration in neutral solution, using potassium chromate as indicator.

The estimation of sulphate is not carried out so frequently as that of chloride, but when it is necessary the usual gravimetric method, precipitation as barium sulphate from an acid extract of the cloth, seems to give fairly reliable results.

If both chloride and sulphate have been found in the qualitative analysis the estimation of both acid radicles is absolutely necessary, because the chlorides of both zinc and magnesium are deliquescent whilst the sulphates are not. If only chloride is present the chief use of an estimation is as a check on the determinations of the metals.

Estimation of Phosphorus

Strictly speaking, this is not part of a size analysis, but is included here because it is often a useful supplement to the latter when complete characterization of a cloth is required. Its chief use is as a means of distinguishing between American and Egyptian cottons. For details of the very simple method described by Geake, the original paper should be consulted.*

Other Determinations

The estimations which have been very briefly described above include all those which usually comprise a complete size analysis. They do not, however, give all the information which it is often desirable to have. As already pointed out, starch is not estimated directly, and therefore the figure for this important constituent is always open to doubt. Apart from the desirability of having a method for the direct determination of starch, it would be useful to be able to ascertain the variety of starch which has been used, but, since unbroken starch granules are very seldom to be found in even imperfectly cooked size, the usual method of identification, by microscopic examination, cannot be applied, and, in fact, one adhesive only can be detected with any certainty. A determination of the amount of nitrogen in the cloth will nearly always decide whether wheaten flour has been used, but if the size contains a mixture of wheaten flour and another adhesive it is not possible to obtain more than a rough idea of the relative proportions, for neither the percentage of protein in flour nor the amount of nitrogen in cotton is sufficiently constant.

The fairly common use of antiseptics other than zinc chloride presents to the analyst a somewhat difficult problem. Such substances are used in much smaller proportion to the quantity of other ingredients than is zinc chloride, and do not usually have any specific effect on

‡‡Fales, "Inorganic Quantitative Analysis." (London, 1928.)
§§Bean and Scarisbrick, "The Chemistry and Practice of Sizing," 10th ed., pp. 591-612. (Manchester, 1921.)
‖‖Ermen, "The Materials Used in Sizing," p. 82. (London, 1912.)
¶¶Fales, Inorganic Quantitative Analysis." (London, 1928.)
*Geake, "J. Text. Inst., 1924, 15, T 81.

the weaving qualities of the warp or on the feel of the cloth. Their estimation is, therefore, often unnecessary —if the analysis is carried out for matching purposes, for example; but in the case of mildew damage it is very important to be able to tell whether the cloth actually does contain the antiseptic which ought to be there. The problem is simplified somewhat by the fact that in such cases the analyst knows which particular antiseptic to look for, but even then an accurate estimation is often out of the question and a qualitative test is the most that can be achieved. Salicylic acid, for example, has been in common use for many years, but no method for its estimation in cloth has yet been described, and the writer's experience, in common with that of other analysts, has been that salicylic acid, once put into a cloth, can never be quantitatively recovered, and that an attempted determination is always of very doubtful accuracy. It is to be hoped that "Shirlan," the promising new antiseptic patented by the B.C.I.R.A., will behave more normally, and that a method of analysis will become available.

As already indicated, the results of a size analysis are preferably stated as percentages of dry materials on dry cloth. This method has two advantages over the more usual procedure: (1) Analyses of different cloths, or of the same cloth carried out at different times or by different analysts, are more readily comparable, owing to the elimination of a figure which has no constancy. The amount of moisture in a cloth varies from day to day, and bears no relation to the amounts of size ingredients. (2) It simplifies the calculation of the amounts of materials which were actually used in the tape-room. Adhesives and china-clay, as commonly used, all contain fairly large amounts of moisture, very different from the amounts they retain as constituents of a sized cloth, and, in cases of cloth-matching or of tracing errors in size mixing, it is necessary to translate the results of an analysis into tape-room weights. The average figures for moisture in the most common materials are as follows: Wheaten flour, 11 per cent; sago flour, 17 per cent; farina, 20-21 per cent; china-clay, 11 per cent. Zinc and magnesium chlorides are almost always used as solutions of definite densities, and the percentages of solid materials contained therein are ascertainable from well-known tables.

In conclusion, it may be pointed out that some practical knowledge of sizing is almost essential to anyone who undertakes this class of analytical work. If an analysis, carried out on conventional lines gives results which are recognized as unreasonable from a practical point of view (and this is by no means a rare occurrence), there is an indication either that the methods used are untrustworthy or that the cloth contains size of unusual composition and that tests must be made for the presence of the more uncommon sizing ingredients. Until there is a really reliable method for estimation of adhesive substances such practical knowledge is apparently the only means of avoiding serious errors in interpreting the composition of sized cloths. —*Textile Manufacturer.*

The Constitution and Absorption-Spectra of Dyestuffs

***By* DR. A. FOULON**

Translated from Monatschrift f. Textil-Ind., 45, 84 (1930) *by F. S. Beattie*

THE determination of the constitution of dyestuffs by chemical analysis is in general not easy, and is also a tedious process. In consideration of the fact that the physical, especially the optical, properties of these substances possess certain relationships to the structure of the molecule, a convenient assistance in carrying out these investigations has been found to exist in spectrum analysis. We know that organic substances, colorless as well as colored, afford different absorption-phenomena in the visible and invisible (the ultra-violet and the infra-red) portions of the spectrum.

By comparison of the absorption-spectra of compounds of known constitution, it has been established that a connection does exist between absorption phenomena and chemical constitution. This becoming known, it was next a question, under what general laws the absorption-spectra of dyestuffs fell, what fundamental spectral properties belonged to each group of dyestuffs, and what characteristic absorption-spectra were afforded by different dyestuffs in the same group, so that the chemical constitution of a dyestuff could be deduced from the character of its absorption-spectrum. Investigations along these lines

have shown that the spectroscopic method of study possesses a far greater importance, not only for the mere testing of dyestuffs, but also for the determination of their chemical composition, than was at first believed; and that through this method such studies can be not only greatly aided, but that, by it, questions previously unanswered can be solved.

By means of the spectroscope we can easily determine, for example, whether a given dyestuff is a triphenyl-methane derivative, a thiazine, an oxazine, or an azine, an anthraquinone or an azo derivative. Similarly, a mono-amino derivative can usually be distinguished from a diamino—or a triamino-derivative, a hydroxyl from an amino-derivative, a diphenyl-methane from a triphenyl-methane dyestuff, and so forth.

The spectroscopic method for the study of dyestuffs was recommended in earlier years by such workers as Brewster, Stokes, Kopp, H. V. Vogel, Kruess, and others, but for various reasons did not find the general adoption which it deserved. The reasons for this were, the incompleteness of the method itself (at least, as then employed), the unsuitable construction of the spectroscope as then built, and certainly an unattainable degree of previous experience in spectroscopic technique. Thus, the location of the absorption-bands was not cited upon the basis of wave-length, but quoted only approximately; either according to an arbitrarily-chosen scale, or in reference to the principal Fraunhofer lines, which is not sufficient for deciding between many dyestuffs of one and the self-same class. As to the instrument itself, a certain ratio must be observed between the dispersivity of the prism and the focal length of the eyepiece of the telescope, in order to obtain absorption-spectra suitable for analytical study. Today, even small spectroscopes are provided with wave-length scales; the inconveniences of the prism form of instrument, through involvement of a dispersion-curve, are done away with by use of the new grating-spectroscope of Zeiss, in which the wave-length can be read off directly upon a scale.

A further disadvantage was the lack of a uniform system, as, e.g., in the case of qualitative analysis. To be sure, Girard and Pabst, and later H. V. Vogel, described the absorption-spectra of different dyestuffs, but without exact designation of the location of the bands in the spectrum, and without any system. Then, too, the number of the dyestuffs studied and cited was vanishingly small in comparison with the number found in commerce. All these disadvantages did not favor the exact spectroscopic analysis of dyestuffs.

Formanek has now obviated all these difficulties through numerous researches, and has brought the spectroscopic-chemical method for determination of dyestuffs to the degree of regard which it today rightfully enjoys. Within the limits of this paper, the many individual points of interest cannot be even mentioned with approximate completeness, but the principal points of chief importance, upon which the method is based, may be briefly spoken of.

1—The absorption-spectra of homogeneous dyestuffs are not formed arbitrarily, but are distinguished by specific forms, whose number is limited, and which are characteristic of each dyestuff.

2—Each homogeneous dyestuff, in solution, affords one or more absorption-bands, whose nature and position in the spectrum is governed chiefly by the constitution of the dyestuff, and in a secondary manner is modified regularly by the solvent used and by the concentration of the solution.

3—The absorption-spectra of dyestuff solutions are often characteristically altered by the action of dilute acids or alkalies.

In the spectroscopic investigations mentioned, the dyestuffs are systematically arranged into groups or subgroups according to color and the form of their absorption-spectra. As a foundation for this division into groups, the differences in form of the absorption-spectra of the different dyestuff classes is chosen. The differences in location of the absorption-bands, and their behavior toward acids or alkalies, serve for an exact characterization of the separate dyestuffs.

The color of the substance, then, is closely connected with its absorption-spectrum. The absorption of light on passage through a colored solution varies, according to the chemical and physical nature of the substance present in solution. The spectrum may be continuous, i.e., it extends from one end of the band to the other without interruption; or it may be selective, i.e., it begins at a certain point in the band, increases gradually in intensity, only to diminish again after attaining a certain maximum; and this phenomenon may repeat itself further on in the spectrum. Thus there are formed, in the spectrum, various dark areas separated by lighted ones—the so-called absorption-bands, according to whose nature and position certain conclusions may be drawn as to the substance present in the solution. The continuous type of spectrum is found mostly in the aliphatic or open-chain compounds, the paraffines and olefines, and in homo—and heterocyclic compounds such as furfurane, pyrrol, thiophene, etc., while the derivatives of the aromatic series, those of benzene, naphthalene, anthracene, pyridine, etc., are under certain circumstances distinguished by selective absorption.

According to the theory of Witt, for the localized absorption of light in the spectrum, certain groups are responsible, groups which are called chromophores, and whose introduction into a colorless molecule causes absorption in the visible spectrum. According to this idea, it is evident that the multiple introduction of chromophoric groups into the molecule will in general intensify the phenomena of ab-

sorption, i.e., must deepen the color of the substance, and, also, that the mutual relation in position of the chromophores, their close grouping within the molecule, influence the color-properties of the substance favorably (we are thinking of dyestuffs, of course). Lastly, the combination of different chromophores in the same molecule into new, e.g., quinonoid, groups, frequently strengthens the color-properties of the substance very greatly. According to Witt, these colored compounds, containing chromophores, are called chromogens (fulvene, phenanthrene-quinone, azobenzene, etc.). Almost all chromogens are reasonably reactive substances, which are more or less easily altered by chemical action. As a consequence of such action, we have to do, in most cases, with the so-called bathochrome and hypochrome groups. Of these groups, those most worthy of special mention are the amino and the hydroxyl groups, which at first were considered by Witt as auxochrome groups, which deepen the color of the chromogen.

Substituted groups, as the dimethylamino and diethylamino groups, possess a similar influence. Beside the mere power of deepening the color of the substance, these groups are known to be capable of changing a chromogen to a true dyestuff, a substance whose basic or acid properties makes possible the assuming of a definite relation to particular fibers. In general, each group which enters the colored molecule shifts the absorption-bands (to some other definite location), and modifies the degree of extinction of visible light (the absorption-bands) in certain regions of the spectrum. This shifting of the absorption-bands is conveniently designated as bathochromic or hypochromic action, while we reserve the terms auxochrome and diminochrome for alteration in the intensity of the color.

The auxochromic theory, here thus briefly sketched, does not suffice for constitutionally alterative substances (as tautomeric compounds), on which account H. Kauffmann has endeavored to extend its scope, especially in consideration of such substances as contain an auxochrome and a chromophore in union with a single benzene ring. According to the investigations of A. von Baeyer, into the constitution of the benzene ring, it is a plausible assumption that the benzene ring alters its condition when certain groups are introduced into it, and that with this alteration in its internal linkage an alteration of its absorptivity of light is closely connected.

Among other points, the position of the auxochromes in reference to each other is of some influence upon this alteration in the internal condition of the benzene molecule; a fact which H. Kauffmann takes note of in his classification of the auxochromic groups. In order to be able to determine the influence of groups which have the power of altering color, we are obliged to measure the displacement of the absorption-limits in the spectrum of the colored substance, and the strength of the absorption in the different absorption-bands. To do this, the substance to be studied is as a rule investigated in the dissolved state, whereby a further variable is introduced, since the true absorptive properties of the substance are influenced by the solvent. This influence is to be ascribed to chemical causes, while the intensity of the absorption is governed by the concentration of the solution, as well as by the thickness of the layer of the substance which absorbs the light.

In all this, the temperature is of little influence. The spectrum, however, as already mentioned, can be affected by the action of reagents upon the solution, if the structure of the dyestuff is thereby altered, e.g., by acid or alkali. But the phenomena of light-absorption should be considered from not only the chemical, but also the physical standpoint, since the reflexive action between light-waves and chemical molecules plays an important part in the generation, so to speak, of the visible phenomena. Really, to arrive at any classification of the light-absorption phenomena as an interaction between the light-waves and ponderable matter, we shall have to assume the existence, in the latter, of "electrical particles," which are excited to activity by the light-waves, whereby these waves give up a part of their energy to the atoms or molecules. Such electrical particles we have, for example, in the negatively charged electrons, and the positively charged "electrical atoms." In connection with this brief hint, the reader needs only to be reminded of the work of Stark, Wien and Thomson. The views which prevail regarding the present topic are based upon the most recent work upon the nature of the atom.

In conclusion, we may say that the spectroscopic method of determination of dyestuffs possesses the advantages, over other methods, of sensitiveness, exactness, convenience, and ease in practise. We often obtain results with it in cases where the chemical method alone is inconclusive. And it is not alone to the textile chemist, but to the research chemist busied with the synthesis of perhaps new dyestuffs, that the spectroscope renders valuable service.

In a new sample card entitled "Palatine Fast Colors on Woolen Yarn," sent out by the General Dyestuff Corporation, a large number of current shades are shown produced on woolen yarn with combination of Palatine Fast colors. The shades obtained are said to be of very good fastness to light, washing, water and perspiration. The card should be of special interest to dyers of knitting and carpet yarn. I. G. 342.

A Comparative Study of Dye Imports January-June, 1930, With January-June, 1929

A comparative study of the dye import statistics for the above periods presents some very interesting facts which in turn lend themselves to various interpretations when considered in conjunction with your own figures and the business condition in the industry for the same period.

The total imports of coal-tar dyes for the period January-June, 1930, amounted to 2,195,555 pounds as against 3,267,478 pounds for the same period in 1929.

It is significant to note that while the decrease in imports of 33 per cent (or 1,071,923 pounds) for the first six months of 1930, was distributed throughout the various application classes of colors, the Vats alone accounted for a little more than 50 per cent of the total decrease (which might be expected since this class of color accounted for about half the imports in both years) and the Acid and Chrome colors for about 25 per cent, the two classes together accounting for about 75 per cent of the total decrease.

It is further significant that of the 33 per cent total decrease about 25 per cent occurred in imports of less than 3,000 pounds and only about 8 per cent in products imported in quantities of 3,000 pounds and over.

Probably the most important fact to appear is that, although there was a general decrease in imports for the first six months of 1930, there was a substantial increase in quantity of certain outstanding imported colors, the totals importation of the 41 colors in this class being 310,000 pounds greater in 1930 than in 1929.

Acheme VII

The Acheme VII, the exhibition of chemical apparatus which is to be instituted in 1933 by the DECHEMA, Deutsche Gesellschaft für chemisches Apparatewesen E. V. has already attracted notifications of their intention to take part from 134 firms, this in spite of the fact that the venue of the exhibition has not yet been determined. Of these firms 63 have already reserved stands so that about 2,000 sq. meters of exhibition floor space have now been ordered in advance.

New Color Card

In a new card "Two-Color effects and Solid Shades on Mixed Fabrics Composed of Cotton and Acetate Silk or Viscose and Acetate Silk" sent out by the General Dyestuff Corporation, a large number of dyeings are shown on cotton-acetate silk mixed goods in two color effects and solid shades. Direct and Diazotized colors are illustrated which leave the acetate silk practically unstained and the Celliton and Celliton Fast Colors, including Cellitazol SR, which dye only the acetate silk and leave the cotton clean. The card also shows Indanthren Dyestuffs which may be dyed on such material without staining the acetate silk. I. G.-10.

Spring and Summer Color Chart

The Textile Color Card Association recently issued its Color Correlation Chart for spring and summer, 1931. In the chart, the fashionable color families for daytime and evening wear are listed according to their cast, and for each group are given the coordinate colors for accessories, including shoes, bags and hosiery. The new blues for street wear, for example, are classified as navies, flag blue types and greyed blues.

As color combinations will constitute an outstanding fashion theme for spring and summer, special significance is attached to that portion of the chart which suggests the smartest color harmonies and contrasts. Highlights in three as well as two color combinations are cited.

The chart, which mentions but does not portray the new colors, is to be used in conjunction with the various 1931 Spring Season Color Cards for silks, woolens, shoes and leather and hosiery issued by the Textile Color Card Association.

It will serve primarily as a guide to retailers in carrying out the correct color coordination between the apparel and accessory departments of the store.

The chart will likewise prove useful to manufacturers of accessories in indicating the new shades which complement the fashionable colors in costumes.

Exposition of Chemical Industries

The Exposition of Chemical Industries which will be held at the Grand Central Palace May 4th to 9th, regularly draws together some four hundred leading manufacturers who will show products and equipment used in more than forty odd industries. No similar opportunity is given anywhere else for studying the latest designs in a vast array of materials and equipment.

Many advances in electrical equipment for control of chemical and non-chemical processes in laboratory and factory will be shown at the coming Exposition. Drying and baking ovens in a wide range of sizes, large, temperature-controlled tanks, sensitive thermostat controlled water baths, humidity-controlled cabinets, liquid air tanks, temperature regulators, etc., are some of the devices by which electricity is harnessed to meet the needs of the chemist in laboratory and factory.

One interesting advance in thermo-electric science to be shown at the Exposition is an electric oven in which a blast of hot air is circulated horizontally at high velocity over the contents, passing between shelves and racks thereby effecting great saving in time, improving heat distribution and insuring more uniform temperature control. Ovens of this type are designed to meet the requirements of exacting research where it is desired to maintain accurate and uniform heating conditions in all parts of the oven chamber, and for other similar applications. They are furnished in sizes from small, bench equipment with a cord for connecting into the lighting circuit and rates as 50-watt size, up to a 2,700-watt size with a temperature range from 150 to 260 degrees C.

Nitro and Amido Compounds*

Safe Practices in Production of Dyestuffs and Explosives Materials

THE manufacture of nitro and amido compounds occurs chiefly in connection with making dyes and explosives. The manufacture of dyes in the United States has grown by leaps and bounds since the war, and while a considerable amount of explosives was manufactured before the war it was the war experience that brought to the front the necessity for the study of the hazards in the industry. Fortunately, most of the smaller plants have been closed, and improvement in working conditions has been hastened by the concentration of dye intermediate manufacture in a few large plants. We will not attempt to describe the process used in the manufacture of nitro and amido compounds, but will confine ourselves in this discussion to the dangers resulting from the manufacturing process and the safe practices to be pursued.

Two of the most important nitro compounds are Mononitrobenzene ($C_6H_5NO_2$) and Metadinitrobenzene ($C_6H_4(NO_2)_2$). The first is a yellow oily fluid, smelling like oil of bitter almonds, insoluble in water but readily soluble in fats. It therefore passes easily through the skin and may cause poisoning in this way, or by the inhalation of fumes. Occasionally it is spilled or splashed on the skin and then the symptoms of poisoning come on very quickly. If the clothing is soaked with nitrobenzene the resulting collapse may be very sudden and severe.

Dinitrobenzene (meta) is a solid, which volatilizes at ordinary room temperatures. This compound is considered the most useful that is used in aniline-dye manufacture. It is not more poisonous than mononitrobenzene, but the requirements of manufacture are such that men are necessarily brought in contact with it to a greater degree and industrial poisoning is, therefore, harder to control. The symptoms of acute poisoning are no different from the poisoning from nitrobenzene. However, there is a more chronic form which makes this compound more troublesome. The workers who are affected become emaciated and weak, the skin takes on a dirty yellow color, the pulse becomes weak, there is dizziness, and a narrowing of the field of vision. The blood becomes chocolate colored and there are disturbances of sensation, especially a feeling of cold and weight in the legs.

Danger in Dinitrobenzene

In American establishments dinitrobenzene, or DNB, as it is called, is the only substance that causes real alarm and in fact it is much dreaded. There is more exhaustion, more weakening of the heart, than in poisoning from aniline, and the effects of an acute attack last much longer, dragging on sometimes for days and weeks.

It is not only in the production of DNB but in its use as an intermediate, such as for reduction to metanitraniline, that the danger arises. Formerly DNB used to be run out into open pans, where it caked, and men were sent to chop up the cakes and shovel the fragments into trucks, in the course of which a great deal of poisoning occurred. Later this method was generally abandoned, and the molten DNB is now usually run out to meet a stream of cold water, which granulates it. However, the handling of this material after it has solidified may expose the men to sufficient fumes to poison them because of the property of the material to volatilize at room temperatures.

Two other nitro compounds should also receive consideration. Ortho and paramononitroluene ($C_6H_4CH_3NO_2$) are used to produce by reduction the important intermediates ortho and paratoluidin. During the war it was used as a stage in the manufacture of TNT and it is also used in the manufacture of dyestuffs. It is generally considered that the ortho is most poisonous of the mononitrotoluenes, but neither the ortho nor the para is as toxic as mononitrobenzene. They act more slowly and seemingly only on susceptible subjects, for many men can handle them without any trouble.

The French and German authorities, who made very exhaustive investigations of the poisonous effects of DNT and TNT during the war, seem to feel that the pure substances are only slightly toxic. The worst place in a nitrating department for DNT is the centrifuge for the separation of DNT from other products of nitration, and the men engaged in such work believe that the oily liquid which separates off and is rejected is the source of the trouble.

Trinitrotoluene is a slow acting poison and affects about one-third of the people exposed to it. Injury to the bone marrow causes a great destruction of red blood cells and as a result a hematogeneous jaundice develops. Trinitrotoluene is not used in dye manufacture but it is important in this connection because TNT poisoning may serve to give a better understanding of the effects of similar compounds that are used in dye manufacture.

In addition to the compounds already mentioned, there are the nitronaphthalenes ($C_{10}H_7NO_2C_{10}H_6(NO_2)_2$, etc.), and anisol ($C_6H_5H_3O$), which should be thoroughly investigated by all establishments manufacturing or producing them. Their poisonous effects are very slight and some people consider them practically harmless. Nevertheless the possibility of poisoning is there, and the proper precautions should be taken.

Before leaving the nitro group, it is important to call attention to one other compound. It is dinitrophenol 1-2-4. It is important because its physiological action

*From a paper by Mr. Cyril Ainsworth before the National Safety Congress at Chicago.

differs so radically from the action of all the other known nitro derivatives of the benzene ring. The investigations that have been made by the British, the French, and the United States Public Health Service have developed the following essential facts:

Varieties of Intoxication

There are three varieties of intoxication:

The first is mild, subacute, which serves as a warning to remove the workman from danger in time. There is loss of appetite, nausea, vomiting, colic and diarrhœa, weakness, headache and dizziness. The second form is acute. The onset is sudden with a complaint of extreme weariness in the limbs, painful constriction at the base of the chest, and a burning thirst. Respiration is short and difficult especially on inspiration. The Derrien reaction test of the urine increases in intensity as compared with the first variety. Removal from work, with a rest cure is usually productive of a rapid recovery, but no immunity follows the attack. The third form is fulminating intoxication. The onset is sudden with attacks of weakness, violent colics and diarrhœa. In a few hours a temperature of 104 degrees may be reached and there is intense thirst. Unconsciousness, coma, and death may follow in a few hours.

It is not likely that poisoning from this compound will occur in dye works except as the result of some accident, or leakage.

Considerable time has been spent in analyzing the nitro compounds. Only brief mention will be made of the amido compounds because the symptoms are less serious. While cyanosis is deeper with an amido compound, the prostration is not as severe. The effects of the nitro group on the nervous system, changes in pulse, respiration, and body temperature are much more grave with dinitrobenzene than with the amido compounds. Literature on the subject gives a very complete history of the effects of aniline poisoning which is not necessary to repeat.

The Toluidines

The toluidines ($C_2H_4CH_3NH_2$) ortho and para are considered by many to be more toxic than aniline. In some plants the toluidines are said to give more trouble than the aniline, not necessarily because they are more poisonous but because there is not any process in aniline manufacture except repairing and cleaning which necessitates as much exposure to fumes and contact as does the centrifuging of the two toluidines.

The diamines ($C_6H_3H_3(N_2H_2)$ are notoriously toxic; the phenylendiamines ($C_6H_4(NH_2)_2$ such as are used in the dyeing of furs and which cause very severe eczema ulcers and cellulits in fur dyes, and sometimes in furriers and wearers of dyed furs; nitraniline ($C_6N_4NH_2NO_2$) which is quite toxic, and isomers of which cause very distressing, burning, and itching skin eruptions and in some cases serious and even fatal systematic poisoning. Methyl and ethyl aniline, which may contain some unchanged aniline and several others of the amido compounds which are more or less productive of industrial poisonings are important enough to receive the very serious consideration of those engaged in their use or manufacture.

It has already been mentioned that a much better control of these industrial poisons exists at the present time than was the case during the war because so many of the smaller plants which were hurriedly constructed for war purposes have stopped operations, and the manufacture is now concentrated in a few large companies. This has brought about better constructed buildings. The mechanical apparatus used is better constructed and arranged. The processes themselves are conducted in such a way as to make contacts with the compounds by the workmen unlikely.

Lessons Learned by Experience

From the experience of the past we have learned the following lessons:

The buildings in which nitro and amido compounds are constructed should have the best ventilation that it is possible to secure. The floor should be of a non-absorbent material, smooth and easy to clean. The walls should be calcimined at least once a year and otherwise be kept clean. If any nitro and amido compounds are spilled on the floors they should be removed as soon as possible and the floors should be regularly cleaned every 24 hours.

It is necessary that the employees be acquainted with the poisonous quality of the compounds in order that they will be impressed with the necessity of complying with the health rules which have been established. Shirts, overalls, caps, stockings, shoes, gloves and other wearing apparel which may have become saturated with poisonous compounds should be immediately taken off, the skin washed, and clean clothing put on. Employees should be warned that the use of alcoholic liquors and chewing tobacco is harmful to their health.

The keeping or eating of food in the workroom must be absolutely prohibited. A suitable dining room absolutely separate from the workroom should be provided, and employees should not be allowed to enter the room until they have washed both face and hands. Process men should be provided with two lockers, one for street clothes and one for working clothes. Everything possible should be done to get the process men to take a bath daily before they leave the plant and they should be cautioned against starting work on an empty stomach.

It is vitally important that all process men be physically examined by a licensed physician before commencing work and at least once in every thirty days thereafter. Men who suffer from inflammation of the bladder or who are addicted to the use of alcoholic liquors or who suffer from excessive perspiration should not be employed.

From these recommendations it will be seen that cleanliness is the watchword in the manufacture of nitro and amido compounds. Cleanliness in building maintenance, cleanliness in personal habits of employees and cleanliness in conducting the process.

Chemical Director Appointed for Swann Companies

Theodore Swann, President of The Swann Corporation, announced recently the appointment of Paul Logue as Chemical Director for the Swann companies. Mr. Logue has been Chief Chemist at Provident Chemical Works, the St. Louis Division of The Swann Corporation, and Vice-President of Swann Research, Inc. He will be stationed at Birmingham, Alabama, the headquarters of the Corporation.

Industrial Research Laboratories

This book on Industrial Research Laboratories of the United States contains an alphabetical list of about 1,625 laboratories, a list of more than 1,900 directors of research, a geographical index and a subject index.

Each laboratory is listed according to location, men employed, type of work and research activities.

The Bulletin may be obtained from the Publication Office, National Research Council, Washington, D. C., for the sum of two dollars.

Rapp Elected To Research Society

Frank U. Rapp, naval stores department, Hercules Powder Company, has been elected to junior membership of The Arkwrights, textile research society, it is announced by officials of the society.

Mr. Rapp is in charge of industrial sales development of pine oil for the Hercules company and in this connection has been active in research and educational work dealing with the use of pine oil in the manufacture, treatment, and laundering of textiles.

Hercules Creates Foreign Relations Department

A new department to be called the Foreign Relations Department has been instituted by the Hercules Powder Company, according to an announcement by President Russell H. Dunham. In charge of the new department will be Peter W. Meyeringh, until recently manager of the Hercules European connection, the N. V. Hercules Powder Company at Rotterdam, Holland.

The purpose of the new department, according to Hercules officials, will be to coordinate sales and the development of new business in foreign lands. Hercules products are now being distributed in many countries throughout the world, the company's export business amounting to more than 10 per cent of its total sales volume. Among the principal products sold are cotton linters, nitrocellulose, turpentine, rosin, and pine oil.

Commenting on foreign trade, Mr. Meyeringh states that its importance has increased to where in a number of industries it represents the balance between poor and flourishing business. This year, he says, the world export figure is off about 8 per cent and the United States has lost 15 per cent. In spite of this recent down turn, he continues, international trade is still about 16 per cent greater in volume than it was in 1925, and the exports of the United States alone are on a par with 1926 and 35 per cent greater than before the war.

Textile Research Council

Textile Research Council has turned over to U. S. Institute for Textile Research, Inc., its records and small cash surplus. It was organized in 1926 to aid the promotion of pure and applied technical textile research, and with the research committee of the American Association of Textile Chemists and Colorists was the chief sponsor of U. S. Institute for Textile Research, Inc. As the latter organization is now functioning on a permanent basis the executive committee of Textile Research Council believes that its members should give all possible aid to the new organization, and more than 75 per cent of them have already done so by taking out membership in U. S. Institute.

The American Association of Textile Chemists and Colorists is also represented in U. S. Institute by a large number of its members, and has also endorsed the latter's work by taking out a life membership at $1,000 and a contributing membership at $100. The money for the life membership was originally appropriated to finance the efforts of a special committee to promote interest in a central research body, and that was instrumental in the organization of U. S. Institute for Textile Research, Inc.

U. S. Institute Directors' Meeting

The first quarterly meeting of the board of directors of U. S. Institute will be held Tuesday, February 24, at the Chemists Club, New York City. Meetings of the executive committee and research committee will also be held at the same time. Only reports of officers and committees and other forms of business will be transacted, but as this is the first meeting of the directors to be held since permanent organization last November it will be of more than usual importance and interest.

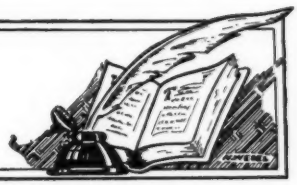
Appointed Assistant Director of Mellon Institute

Dr. Edward R. Weidlein, director of Mellon Institute of Industrial Research, Pittsburgh, Pa., has announced the appointment of Dr. Leonard Harrison Cretcher to an assistant directorship in the institution. Dr. Cretcher, who, since 1926, has been serving as head of the Institute's Department of Research in Pure Chemistry, is a specialist in organic chemistry and will have supervisory charge of a group of industrial fellowships that are concerned with problems in organo-chemical technology.

In addition to serving in this positional capacity, Dr. Cretcher will continue as directional head of the Department of Research in Pure Chemistry. Beside Drs. Cretcher and Nelson, the departmental staff will include Drs. C. L. Butler and Alice G. Renfrew, who has just come to Mellon Institute from the Sterling Chemical Laboratory of Yale University.

The Carbic Color and Chemical Co., Inc., recently acquired the business of the Products Color Corporation. All products formerly supplied by them may now be obtained from the Carbic Color and Chemical Co., Inc.

Technical Notes from Foreign Sources



Interaction Between Fiber and Dyestuff in Substantive Dyeing, I

Dr. W. Weltzien and Dr. K. Schulze—Seide 35,360 (1930).—The first part of a serial paper. This present introductory section cites five papers already published in Seide by the same authors, from 1926 onward. These earlier papers have dealt with the question of uneven dyeing upon artificial silks, and the causes of this unpleasant phenomenon from the side both of dyestuff and of fiber. Among other definite points, such matters have been dealt with as, the degree of dispersivity of about 150 commonly used dyestuffs, their capillarity, the results of ultra-filtration of their solutions, and their salt-flocculability. Going on from these fundamentals, the authors have also studied the penetration into the fiber of these dyestuffs, in relation to their dispersivity, the action of salt in the bath, and the nature of the fiber. Further, their work has touched upon the classification, or grouping, perhaps it is better called, of these dyestuffs according to their property of dyeing level or unlevel, upon striped unions; and, finally, the significance of temperature, and the usual salt-additions, etc., has been looked into. The mere mention of these topics will remind one of the confusingly manifold nature of the subject; yet these various methods of approach are all seen obviously to be necessary in arriving at even an approximation to the solution of the simple question—why do some dyestuffs dye unevenly upon some fibers?

In the introductory sections of this installment, the authors make some thoughtful general observations, which, like many such remarks, seem perfectly obvious —after some one else has made them. For example, approaching the problem of dyeing from a purely physical or physico-chemical viewpoint is not justified by results. The phenomena of even or uneven dyeing furnish the most sensitive indicators of the course of reaction (and, naturally, the taking up of a dyestuff by a fiber really has to be looked upon as a reaction, after all, even in the restricted or exact sense in which we use the term reaction in chemical work). The study of substantive dyeing, carried out on the scale involved in the authors' work, may be questioned as to its value, until one recalls how largely time, money, and trouble are involved in the technical application of merely the substantive dyestuffs alone; and that it is surely better to do a great deal of work to clear up the trouble encountered in this group, and to have it over with for good, than to allow the industry to go muddling on, indefinitely, avoiding trouble by shifts or substitutive experiments, with the fear of only postponed trouble always impending in the background.

The first point discussed in this section is that of the relation between the amount of dyestuff taken up, and the tone produced. Reference is made to work already carried out by the authors upon Brilliant Benzo Blue 6B and viscose, which showed that the taking up of dyestuff and deepening of tone bear a regular relation to each other: yet this is not so simple as it seems, since if the fiber is already partly loaded with dyestuff, the taking up of a little more may not, or does not, increase the visible depth of tone perceptibly. Then, too, the phenomena vary quantitatively according to the fiber being used, e.g., as between viscose and cotton. For purely optical considerations are valid in these cases—superficial luster, diffuse dispersion of reflected light, etc., and possibly also the depth of penetration of the dyestuff particles into the fiber. It is in this connection that various investigators display a preference for the colorimetric measurement of dyestuff absorption—a method rather obviously to be called one of practical, rather than of absolute, value. But for an exact insight into the process of dyeing, only the method which rests upon the degree of absorption will suffice, since it automatically shuts out these complicating factors. The authors state that the degree of absorption of dyestuff is by far the most important factor, according to their studies, which has any influence upon the result of the dyeing. Although the authors consider colorimetric measurements as deserving only the grade of "practical" (see above) in evaluation of results, they point out emphatically that the colorimetric method is of the highest value in cases where deep dyeings display no difference in depth even to the skilled eye. The Pulfrich photometer is referred to, and a table of grouped dyestuffs, grouped by its use, according to color.

Exact details are given for the method pursued in the quantitative dyeings for degree of absorption.

The latter part of the paper deals with the effect of various concentrations of salt in the bath. In this part, three tables and one graph (for 5 dyestuffs) are added.

As the paper is to be continued, no general conclusions can as yet be drawn.

Linseed Oil as Finishing Agent on Artificial Silks

Dr. G. von Tobel—Seide 35,365 (1930).—The author, an expert of the Textile Finishers' Society in Krefeld, gives the results of his experience with linseed oil as a finishing agent.

He remarks that the results with linseed oil surpassed those obtained with any other agent, up to the point where, in dyeing, the finish had to be removed from the goods. (This is true of cases in which the fiber was

finished with the oil in spinning and weaving, and came, all finished, to the dyer). It would then be observed that here and there in the weave there would occur strands which were of a yellow to brown color, which could not be removed entirely even by strong boiling off. The case was still worse, when finished goods which had been dyed with the finish still on needed to be freed of the finish. In such cases, in the boiling off, the color was frequently fixed upon the fiber. Such a state of affairs prevailed usually when mixed weaves containing acetate silk were in question. Such imperfectly de-finished goods could of course not be used for whites or light tones. The blame was naturally cast upon the dyer, who proceeded to devise new methods for removing the finish. These methods are in general use to-day; they consist in treatment of the goods with soap, and in some cases a fat-solvent, alkali, and in case of necessity a bleaching-agent, as sodium perborate. The temperature of treatment has been found to be of importance, for too strong boiling off may "burn on" the linseed oil; i.e., so fix it upon the fiber, that it cannot thereafter be removed in any way. The weaver in course of time learned, also, so to store his woven goods, that a minimum of yellowing, or as we now call it, oxidation, of the finishing agent may take place; the finisher also has learned to use in his materials only such dyestuffs for tinting, as will permit complete removal of these with the finishing agent.

The dyer has had to learn how to detect rapidly the presence of linseed oil in the goods which he receives for dyeing. The general test is, the striking of a dark color in the goods, when they are spotted with a solution of sodium sulphide in water or aqueous alcohol; due to the formation of the sulphide of the metal whose oxide was used in preparing the oil (lead, for example). Goods finished with linseed oil, if heated in the drying oven, darken to a brown, and this coloration is deepened if the goods are moistened with ammonium chloride solution.

Yellowing of the goods is usually and correctly ascribed to oxidation. But there are some facts known, of a rather puzzling sort, if the process is really one of simple oxidation only. Goods stored in darkness, and exposed as little as possible to air, yellow far less than do those which are exposed freely to both light and air. Yet the yellow color disappears when the goods are bleached with oxidizing agents, by exposure to sunlight, or to the mercury vapor lamp. Viscose strands finished with linseed oil and hung up in air, protected from direct sunlight, are more strongly yellowed in the interior of the strand than the outer portions. Similar strands, folded closely together to simulate the condition of packed goods, showed only slight yellowing in any part. Apparently, all which we can say properly at present is, that the yellowing involves oxidation in some way, but that direct oxidation does not produce the yellow substance.

An interesting question raised is, whether the linseed oil finish, in the case of stored goods, may not bring about upon the fiber chemical or physical changes, which might alter its affinity for dyestuffs. This question was tested by examination of finished goods stored for 4 months and for 2 years, in comparison with the unfinished original material; samples of each of the three lots were treated in a de-finishing bath and then dyed. The de-finishing was easily successful in case of 2-year old viscose, but not perfect with 2-year old acetate silk, which required a bleach with peroxide in addition. The viscose samples were dyed with Chicago Blue, the acetate silk with Cellitone Fast Blue; the 2-year old samples were also dyed with Methylene Blue. In all cases, the dyeings on the finished and then de-finished goods came out somewhat lighter than did the raw material. This difference was more evident in the case of the viscose than of the acetate silk.

This difference in affinity, though slight, points to a formation of oxycellulose, which is more decided in the viscose, or free cellulose, than in the partly acetylated, and so more or less protected, cellulose, the acetate silk. Tests have been made upon the strength and elasticity of the finished goods in strand form, along the same lines. Graphs are given; e.g., for each of these values for freshly-finished, 4-month old, and 2-year old, finished material, Bemberg, Glanzstoff, Agfa, Chatillon, Tubize Setilose, and Rhodiaseta. The graphs, rather simple affairs, are summarized in a short table, as is the loss in strength; in which tables and graphs it is to be remarked that there is a loss in every case, but that these values range from 0.8 per cent to 23.3 per cent. "In spite of isolated cases of variation, which are clearly to be ascribed to the differences in material and finish used, the figures make it possible to see plainly that the decrease in strength of the fiber, even after storage for 4 months, is still quite slight, and amounts to about 1/3 to 1/4 of the value which is reached after two years. Even after this time, when the loss in strength of the viscose silk amounts to about 20 per cent, we are not justified in speaking of a destruction of the silk. In comparison with viscose, the smaller loss in strength of acetate silk is remarkable."

Some attention has been paid to the finishing oil which has been applied to the fiber and aged there in situ. The alteration in the linseed oil appears to be that only of linseed oil itself, i.e., the fact that it is in physical union with the fiber does not appear to produce any complications in the still ill-understood process of alteration or oxidation, in the aging of linseed oil. Three of the graphs show the degree of change in the iodine number, acid number, and saponification number, respectively, of the oil-finishing after a short time ("fresh"), after 5 months, and after 2 years, respectively. It is hardly possible at present to correlate the matter with the formation of oxycellulose in the fiber, at least, with involvement of the agency of the metallic oxide contained in the oil.

Fastness Standards

Text. Manuf. 56, 185 (1930).—A paper critical of the German fastness standards, but in an appreciative, courteous spirit. The article is anonymous, but is stated to be written by a German author, as is suggested by the reference at the close. It is stated that the German standards are being used quite largely in England at present, owing both to lack of suitable English ones and to the recognized excellence of the German ones. The J. Soc. Dyers Col. has appointed a committee to oversee the working out of standards of fastness, to light, washing, and perspiration particularly, and this committee is diligently at work. But there seems to be some misunderstanding of the requirements properly to be made upon standards. The object of the Society is the establishment of standards of fastness for dyed material, not for the dyestuffs themselves, and even with dyed material the fastness varies with the method of dyeing chosen. If the Society succeeds in setting up satisfactory standards, there will be three systems, the German, the American, and the British, from which the dyer will have to choose. Dr. Krais, the Director of the German Textile Research Institute, has recently proposed to solve this question by international acceptance of the German standards already set up and in operation; a naïve proposal, but one, in view of the high standing of Dr. Krais, not to be rejected without at least respectful consideration.

The article closes with some sensible criticisms of some of the German standards. Apparently the article is based upon, or is a translation of, a paper appearing in the Deutscher Kunst-Seide Kurier, No. 113, Apr. 15, 1930.

A New Procedure in Naphthol AS Dyeings

W. Christ—Mell. Textil-Ber. 11, 447 (1930).—A paper dealing with the soda development procedure of K. Jellinek. According to C., the method is the best yet developed, giving results which are excellent with all bases commonly used, even with those which are considered to be poor couplers. Further, no treatment to diminish or remove the alkalinity of the padding is necessary. The older additions for this purpose, of magnesium or zinc salts, are no longer needed. Neither addition apparently has any effect in slowing down the coupling; but the presence of zinc salts does appear to affect the wetting-out properties somewhat unfavorably; so that care would need to be used if such additions were in question.—One graph is given.

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p-Nitro-aniline, p-Amino-acetanilide, p-Phenylene-diamine

Id. vol. 15, *No.* 380, *Dyest. Monthly Suppl. p.* 29.—Valuable papers upon the large-scale production of these important intermediates, with much detailed information upon the conditions met with in large-scale work, details so often appallingly serious when successful laboratory procedures are translated from a few grams to lots of a quarter of a ton or more.

Artificial Silks of Great Fineness

Dr. A. Herzog—Kunst-Seide 12, 221 (1930).—The closing section of a serial paper. Most of this part consists of a table which gives such numerical values as length in mm., thickness in mus, breadth in mus, total cross-sectional area in square mus, all of individual fibers, including such varied sorts as 8 kinds of cotton, milk-weed silk, willow silk, jute, clover, lupine, elder, goldenrod, New Zealand flax, and cocoanut fiber—an astounding amount of careful measurement upon an astonishingly long list of sources.

One illustration gives an illuminating idea of the relative fineness of some fibers, by displaying their equivalent cross-sections as circles, within an outer circle which represents the cross-section of an average hog-bristle. The simple illustration gives the best, most striking, picture of the exceeding fineness of some of the fibers mentioned, which we have ever seen.

Fractionation of Cellulose Esters (Nitrates)

J. Duclaux and R. Nozdu—*Rev. Gen. des Colloids* 7, 241 (1929).—A record of experiments which endeavored to isolate nitro-celluloses of definite and constant composition. Solutions of nitro-cellulose were fractionated in various ways, and the products investigated. In the case of acetone-water mixtures, the fractions obtained were of decreasing viscosity, from the first fraction, which formed a characteristic gel, down to fractions which approached homogeneous sols, whose viscosity was in direct relation to their concentration. Ultra-filtration and electrolyte-coagulation made still further fractionation possible, but noteworthy distinctions in the viscosity of the fractions were not attainable. The authors conclude that the difference in the viscosity of the fractions is based only upon a physical difference, in the size of particle. No difference in N-content could be established.

Dyestuffs for Cellulose Esters

German Patent No. 450,971—*I. G. Farben-Ind. A.-G.*—(29. IX. 1927)—The salient point of the procedure consists in the use of diethyl-aniline sulphonic acids or their substitution products as second components, with unsulphonated aromatic bases containing at least one nitro group.

For example, acetate silk is dyed in a bath containing 6-nitro-2-amino-toluene coupled as usual to diethyl-aniline m-sulphonic acid, with or without addition of salts or acids or protective colloids, dyeing at 60-70° C. for ¾ to 1 hour. This dyestuff gives a strong golden yellow. If 4-chlor-2-nitro-aniline or 4-nitro-2-aminobenzoic acid esters be used as the first component, bright orange dyeings are produced — 2-4-Dinitro-aniline gives a strong red-violet dyeing.

Most other acid azo dyestuffs give poor or worthless results upon acetate silk.

General Dyestuff Releases

The General Dyestuff Corporation has recently issued circulars describing some of its new dyes. As stated by the company, the characteristics of the dyes are as follows:

Sulphon RA—acid color. It produces bright yellow shades of very good fastness to light, washing, fulling, water and salt water. The shade is only slightly dulled by chrome, therefore it is suitable for straight and combination shades for chrome-topping. It is also of use for pure and tin weighted silk. G-65.

Fastusol Grey GG—fast to light direct color. It produces greenish grey shades on vegetable fibers. It dyes level and is excellent for combination shades. Very good solubility makes it suitable for machine dyeing. In mixed fabrics, wool and silk are only stained; acetate silk is stained fairly yellow, but may be discharged to a clean white. I. G.-431.

Rapid Fast Yellow GH Powder—rapid fast color. It is a stable powder compound and corresponds in fastness properties with the combination Naphthol AS — G Rapidogen G, which has not been available as a rapid fast color. It produces bright yellow shades of excellent fastness to washing and chlorine and very good fastness to light. I. G.-409.

Palatine Fast Marine Blue REN—acid color. It dyes very level and produces on wool, bright bloomy navy blue shades which show very little change under artificial light. The fastness to light, washing, water, salt water, ironing and perspiration is very good. I. G.-337.

Indanthren Bordeaux B—vat color. It produces on vegetable fibers full bluish claret shades of excellent fastness to washing and chlorine and very good fastness to light. It has high tinctorial power and is suitable for printing. I. G.-436.

Fastusol Rubine BB—fast to light direct color. On vegetable fibers it produces bluish red shades of excellent fastness to light. It also has a good affinity for pure and tin weighted silk. Cotton-silk and cotton-rayon may be dyed uniform shades. I. G.-418.

POSITION WANTED

Young man, 12 years' experience in laboratory of dyestuff concern. Familiar with the application of all classes of colors. Desires position in laboratory of dyestuff company, mill or sales. Single, can go anywhere. Address: A. E. Raimo, 1660 59th St., Brooklyn, N. Y.

POSITION WANTED

Dyer, 38 years of age, married; 20 years' experience on cotton, rayon and mercerized, skeins and warps. Shade matching. Worked with direct, sulphur, developed and vat dyes. Best references. Full information upon request. Address: Classified Box No. 656, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED

Chemist — Seven years' experience, manufacturing and research on azo dyes and sulphonated oils. Reasonable salary. Good references. Address: Classified Box No. 648, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

PRINTER

Chemist-Colorist, 35 years of age, married, last 6 years Supervisor of Printing Establishment of one of the largest Eastern Plush Mills. Experienced in the printing of all colors on Mohair, Silk, Rayon and Cotton Plushes, also Brocaded Velvets and Soda Prints. Some Laboratory, Dyeing and Finishing experience. Will locate anywhere. Address: Classified Box No. 654, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Colorist and dyer on book cloth, Para linen and Box tape. Perfect shade matching. Several years' experience. Best references. Full information upon request. Classified Box No. 658, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

As Dyer of Cotton, Rayon, Silks, Crepes and Celanese, on jigs, pads or reels for plain or print goods. Age, 29; married. Ten years' experience with good references. Will go anywhere. Address: Classified Box No. 655, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

SALES POSITION WANTED

Selling dyestuffs or allied products. Unusually close connections in New York, New Jersey and Pennsylvania territories. Recently connected with large dyestuffs manufacturing company. Available immediately. Address: Classified Box No. 657, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

By a cotton piece goods dyer, either foreman or assistant. Age 44. Eight years' experience. Will go anywhere. Address: Classified Box No. 663, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.